PROCEEDINGS OF THE

NATURAL FORESTS AND WOODLANDS

SYMPOSIUM

"Sustainable Management in a New Policy Context"

10-13 August 1998

Louis Trichardt (South Africa)

Hosted by: Department of Water Affairs and Forestry & Natural Resources & Rural Development Programme, Environmentek (CSIR)

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OBJECTIVES OF THE SYMPOSIUM

The objectives of the symposium are to:

- Create a common understanding amongst role players and stakeholders in the field of sustainable forest management.
- Create a forum where research ideas, results and needs can be shared between researchers, managers, practitioners and government agencies.
- Explore mechanisms for improved and efficient coordination and collaboration between all stakeholders.
- Explore the necessity for establishing an ongoing Woodland Forum as a means of aiding all the above.

FORMAT OF THESE PROCEEDINGS

The compilation of this Proceedings was at the request of the symposium participants, so as to provide a record of what took place at the symposium as well as to provide source material to managers and researchers operating in natural woodlands and forests. Since this aim had not been circulated in advance to speakers at the symposium, not all were able to provide copies of their presentations for inclusion in a Proceedings, and others were only able to supply copies of their overheads, not a written talk. Hence the format of the proceedings is relatively informal, but it does allow the reader to capture the essence of the talks presented. This summary of the workshop proceedings does not extend to copyright of the material included, which may be published elsehwere.

OPENING ADDRESS

Ms Lael Bethlehami

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Today this symposium highlights the significance of a cooperative and integrated approach towards the sustainable management of our forest and woodland resources by all the stakeholders present here, such as educational institutions, research bodies (both local and international) government, and non-government institutions. I am pleased that at this symposium we have delegates from the rural communities who will express their views and give inputs towards this same course.

The White Paper for Sustainable Forest Development in South Africa recognizes the United Nations' Food and Agricultural Organization's definition of forests, which includes woodlands. This has large implications for the Department because it means we must now extend our function. The Department has therefore, possibly for the first time in South Africa, begun to address woodlands as a resource to be managed holistically. Up to now, woodlands have been fragmentally managed, depending upon ownership and land use. This has also meant that different legislation has applied to woodlands, depending upon the land use, thus casting doubts on the importance and value of this resource. Yet we all know that woodlands provide rural communities with food, shelter, fuelwood, medicine and grazing for livestock, to mention only a few benefits. Because of the pressure on the resource, through overutilisation, much of South Africa's woodland is severely degraded (although no-one is quite sure to what degree this has happened). The Department therefore intends to support research initiatives which will address this decline of such an important resource.

The White Paper also recognizes that the forest resource is a national asset, which must be conserved, particularly as an important contributor to greater environmental concerns, such as conservation of biodiversity, protection of water catchment areas, mitigation of global warming and combating dessertification. Without detracting from their importance (in fact adding to it), the White Paper also recognizes the role that natural forests and woodlands can play in local economic development. It recognizes the right of the people, particularly those preciously disadvantaged through exclusive management of the forests, to benefit from the resource, either through sustainable utilisation of the resources or through indirect benefits such as ecotourism, job creation and cultural heritage. The Department addressed this issue in the National Forestry Action Programme (NFAP) by committing itself to engaging in methods of participatory forest management such as Joint Forest Management (JFM) and Community-based Forest Management (CFM).

Both the White Paper and the NFAP address the role of the Department in woodlands and forest research. Whilst it is not the Department's role to carry out research, the Department does recognize its responsibility (alongside other role-players) to coordinate and commission appropriate research in order to better inform policy development and management decisions. Through the

NFAP, the Department has recognized that the conservation of the country's natural forests and woodlands (and by conservation we mean both utilisation and preservation, depending on the appropriateness of either) is one of the eight core functions of the Chief Directorate: Forestry. It is therefore appropriate in this symposium to recognize the important role which research will have to play in answering many of the big questions which we, as national government, will have to answer in order to fulfil our responsibility towards the sustainable management of this valuable resource.

Questions such as:

- What do we define as woodland?
- How much can we harvest sustainably?
- What is a forest/woodland worth, relative to conversion to another land use?
- What is currently being harvested, in what amounts, at what value?
- Can we supplement natural regeneration by planting certain species?

..... need answers.

It is my hope that this symposium will be a forum at which managers, researchers, stakeholders and and other interested person can come together to communicate, coordinate and share a common vision for the future of the natural forests and woodlands. I hope that this first get-together will mark the beginning of a long and prosperous relationship between the Department and other role players and stakeholders, in planning and working together to ensure that the current and future generations of all South Africans can enjoy and benefit from the magnificent forests and woodlands which we are privileged to have in our country.

Finally, I would like to thank the organizers that made this function possible, particularly CSIR, and of course, the Directorate of Conservation Forestry of the Department of Water Affairs and Forestry.

Thank you.

INTERNATIONAL TRENDS IN WOODLAND MANAGEMENT

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WHO ARE WE ?

Conservationists

Developmentalists

WHY ARE WE HERE ?

The White Paper and the NFAP

Sustainable management of natural forests and woodlands (both on and off state forest land) for multiple objectives:

- Global
  - Environmental
- National
  - Environmental
  - Economic
  - Cultural
- Local

RECENT PARADIGM SHIFTS

From	To
Plantations + closed canopy indigenous	Forests and woodlands of all kinds
State land	State, private, communal land
Preservation	Sustainable utilisation
State control and management	Shared management with communities and other stakeholders
Biological sciences	Social sciences

INTERNATIONAL CO-OPERATION

- Since UNCED there is a new pattern of regional and global co-operation
- What is South Africa's role in this global network?
- South Africa can learn a great deal from elsewhere
- Great care must be taken in applying external models to uniquely South African situations

MAIN INTERNATIONAL TRENDS

- Valuation
  - forest goods and services
- Enabling conditions
  - local and national
- Participatory approaches
  - JFM and CBFM
- Recognition of CPR management systems

CONCLUSIONS

South Africa's new forest policy is a turning point

- we share a common objective but represent different interests

- South Africa's new policy is aligned to international trends
  - How should South Africa apply international lessons?
  - What role can South Africa play internationally?

- Main international trends
  - How does South Africa respond?
    - institutions
    - training
    - services
    - research

SUSTAINABLE MANAGEMENT OF NATURAL FORESTS AND WOODLANDS: LESSONS FROM INTERNATIONAL EXPERIENCE

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Introduction

With the change in focus in World Forestry from plantations to 'forestry for community development' which came about in the mid- to late-1970s, much of the attention of foresters in developed countries has been fixed on the destruction of the tropical rain forests. Much less attention has been focused on the dry forests of the tropics and sub-tropics (Shepherd *et al,* 1991). In Africa, the areas of tropical dry forest are still vast, but contrary to popular belief, savannas, not forests, are the most widespread vegetation (White, 1983). Savanna areas are also where most of Africa's populations live (Campbell *et al.,* 1996).

In the past indigenous woodlands were seen as much less productive in terms of timber, and therefore not worth the management effort (Grundy, !995). Thus relatively little is known of the ecology and effects of harvesting on the sustainability of the varied resources which make up the woodland systems. Apart from the environmental protection role that trees play, including acting as carbon sinks, the resources of the dry woodlands are central to the livelihood systems of millions of rural and urban dwellers throughout southern Africa. By far the best-documented product is woodfuel, providing energy to a large proportion of the population. In addition a range of products such as wild foods (honey, nuts, fruits, insects and small mammals), medicines, fodder, soil improvements, fibre and poles support rural and urban living (Campbell *et al.,* 1993; Campbell *et al.,* 1996; Shepherd *et al.,* 1991).

Africa's dryland woodlands and forests are disappearing rapidly through modification by human populations, and human activities are therefore overridingly important in the dynamics of these woodland ecosystems. The constraint is not the availability of woodland and forest, but the identification of management regimes which might preserve them (Shepherd *et al,* 1991). No matter how practical or successful a management regime might be in theory, without the sanction of the people who rely on the resource for their livelihoods, the system is likely to fail.

In this paper therefore, some of the lessons learnt from some fifteen years of international experience in management of natural woodlands and common property resources are described, with a focus on the interface with human populations. Possible management options in the southern African context are given. The emphasis here is on the sub-tropical dry woodlands held under various tenure systems, but the principles remain the same for the pockets of wetter forest found scattered throughout southern Africa.

Lessons from international experience

Historically, indigenous people in Africa and elsewhere have sustainably managed their forest and woodland resources for wood and a wide variety of non-timber products (Grundy, 1995).

Shepherd (1992) points out that 'management' as understood by researchers and foresters (which she defines as the formal drafting of management plans for rotations of particular lengths and specified products) may be quite different from 'management' in the eyes of indigenous, forest-dependent peoples. Shepherd defines the latter as involving a series of mechanisms put into practice by rural people who are co-ordinating their actions with others, under the legitimate control of local authorities. More recently, over the past ten to fifteen years, there has been a history of joint forest management in India, Nepal and Asia, where government-owned forest lands have begun to be managed together with surrounding communities, with greater or lesser success (Shepherd *et al.*, 1991; Gilmour, 1996). Similar interventions have been tried in many other parts of Africa such as Bukina Faso, Cameroon, Ghana, Somalia, Sudan and Uganda (see Shepherd *et al.*, 1991; Hagberg, 1992; Watts, 1994; Matose and Wily, 1996; Prah, 1997; Langoya and Long, 1998; and Meyers, 1998 for some examples).

What can southern Africa learn from such international experience? A study of the success stories in woodland management elsewhere in the past (as well as the many failures) may give useful indications of the requirements for sustainable management systems in general. Key features of indigenous management systems (Shepherd *et al.*, 1991; Gilmour, 1996), as well as common property regimes (Arnold, 1993; Ostrom, 1994) and collaborative initiatives such as CAMPFIRE and joint forest management programmes (Murphree, 1993; Matose and Wily, 1996; Grundy and Le Breton, 1998), include the following:

- **Leadership**. In the past strong and capable managers drawn from the leadership of the local community have controlled the utilisation of local woodlands. These managers, being themselves reliant on the woodland products, have a commitment to the sustainability of the resource, and their rules and regulations are usually attuned to local needs and constraints, which may be dynamic. In addition their authority is seen as legitimate by their constituents.

- **Proprietorship**. Management of natural woodland is practiced by those to whom it belongs, or who have a vested interest in its continued existence, and therefore no serious investment of time and effort in management will be made unless the users can identify a direct link between management input and sustained products.

- **Clear boundaries** to the resource together with a defined user community. Linked to ownership is whether the boundaries of the resource can be clearly defined. Tree resources are easier to define than others such as small game or fish populations or such non-timber products as mushrooms or insects. Recent work (Mandondo, pers.comm.) suggests that defined boundaries can exist for each different woodland resource, some more diffuse than others, which can cause complex rules of access to such resources.

- **Trust**. In cases of management of state-owned forest reserves, the establishment of trust between the government agency in control of the resource, and the resource users is

imperative. Government staff have often been (and still are) cast in the role of 'policemen'.

- **Effective monitoring systems** which feed into the dynamic process of regulation of the resource.

- **Graduated sanctions** for the enforcement of regulations, which are developed and enforced at local level, together with accepted conflict-resolution strategies.

- **Size of resource.** Local communities are more. likely to be able to manage a small patch of woodland surrounding their fields and houses, than a large area of state land.

- **Value.** Management is directly related to value, which in turn can be related to availability. Economic reliance of woodland products provides a strong incentive to use the resources sustainably. It is unlikely, however, that an investment in management will be made for a perceived future scarcity.

- **Management priorities.** Woodlands are managed by communities for a variety of reasons, but primarily for food or livestock production. If woodlands are more valued for the land on which they stand than for the products themselves they are unlikely to survive, despite the effort of conservationists to the contrary.

What is clear from experience to date is that it is no longer possible to manage woodlands and forests in isolation, except in very remote areas. In order to maintain sustainable management systems (in national parks, forest and botanic reserves, buffer zones, communal woodlands and resettlement areas) the needs and influence of the communities surrounding the wooded area must be taken into account (Sayer, 1991; Shepherd *et al.,* 1991; Hall and Rodgers, 1992; Grundy, 1995; Matose and Wily, 1996).

The following issues must be addressed:

- **Prevailing political situation.** Elitist, centralized regimes or those where opposition is suppressed are likely to have a negative effect on any programme which attempts to include grassroots management in a democratic process. A government which values agriculture over forests is likely to legislate against the preservation of forest areas.

- **Institutional structures** (both national and local) which have control or influence over the use and management of local natural resources. A well-resourced, well-trained staff of government extension agents is more likely to be able to carry out its duties than one with budgetary and human resource problems. In addition, the strength of local community leadership will influence the success of any community involvement in woodland management. Rural communities where the traditional leadership still retains power and traditional values are strong are more likely to develop sustainable management systems for the resources they rely on than where local leadership is weak. The presence of active local resource management committees will strengthen regulation of resource use.

- **Legislation governing use and management of woodlands and forests.** Central to the sustainable use of woodlands and forests are the rules and regulations governing use. In the

past ownership of all natural forest and woodland resources has usually been in hands of the State, which was primarily concerned with the extraction of valuable timber species or preserving threatened species. This has effectively criminalized the use of these resources by local people who need them to meet their basic needs. The revision of such laws and policies to create a more enabling environment, where responsibility for management is devolved from Central Government, will encourage the participation of local communities in joint forest management programmes in state-owned forests, as well as in common property resource projects in communal areas (Arnold 1993); Scoones and Matose, 1993; Matose and Wiley, 1996). Local communities are more likely to manage any resource sustainably if they have some stake in its existence.

- **Prevailing social and historical environment** (Shepherd *et* cd., 1991; Bradley and Dewees, 1993; Grundy, 1995; Matose and Mushove, 1996; among others). Without a clear understanding of the complexity of the social environment within which a management programme functions, success can be elusive. This can include:

  - the history of land tenure in the area
  - the heterogeneity of communities which affects their use of forest resources (wealth; religion; ethnic origin; length of residence; gender; age etc);
  - the existing norms which govern use and access by the different strata within the community (women, men, old, young etc);
  - the cohesiveness of the community, i.e. whether there are many migrants or settlers in the area, whether people respect local traditional leadership, or whether people are grouped along ethnic or religious lines;
  - the presence of local elites (councillors, business people, politicians) who have a purely material interest in the resources;
  - the existence of a town or city within a short distance of the woodland area.

- **Proprietorship over the resource.** Communities can only become effective institutions for sustainable resource management if they are granted genuine proprietorship over the resource (Murphree, 1993). In joint forest management projects on state land, local people are often only granted use fights of minor products, rather than being given control over the major resources. There is therefore less incentive to manage the resource sustainably.

- **Benefits.** Any management body (government, private or communal) requires some son of benefit for management inputs. For communities benefits which accrue directly to householders are more likely to ensure continued management than are benefits accruing to communities at large.

- **Management priorities.** These will differ according to the objectives of the management group- government, non-government and private (which includes development agencies and the bio-diversity lobby), and community. Some priorities may be in direct competition with each other, e.g. many rural communities place secondary emphasis on management for wood products, while those of food security (including cropping and livestock management) are of paramount importance (Hall and Rodgers, 1992; Grundy, 1995). Any management system should aim to incorporate the whole range of needs, through the development of collaborative management committees..

- **The nature of the resources.** Woodlands and forests provide a wide variety of products, each of which requires a separate management strategy. Some may be better suited to local management than others. Consumptive safaris and high value ecotourism, for example, may be best contracted out to concessionaires, with revenues accruing jointly to local communities and government departments.

- **The influence of local markets for woodland and forest products.** The impact of commercialisation on formerly communal resources is little understood (Arnold, 1993). The presence of a market could encourage either sustainable resource use, or uncontrolled large-scale removal of products for sale, depending on whether rules governing utilisation are enforced.

- **The dynamic nature of rural livelihood strategies.** Forest and woodland use forms part of a complex system of livelihood strategies which local people use to minimize their risk in meeting their basic needs. This system is extremely dynamic and therefore management systems which involve local people must take this into account.

- **Training.** New management programmes require new thinking and new attitudes. For this reason, training of all those involved (from government staff through development agencies to members of the community) is essential. Success in the past has been attributed to the extent to which local resource management officials are willing and capable of promoting and supporting local level forest management.

Conclusions

In conclusion it must be said that, while collaborative, or participatory forest and woodland management provide many positive experiences and examples from which to draw encouragement, these management techniques should not be seen as a panacea to problems of deforestation and degradation. The initiatives represent a dynamic process which needs flexibility, time and opportunity to evolve and mature, and to diverge to fit different local circumstances and needs. The role of government in the partnership is acknowledged as one key area still requiring attention (Matose and Wily, 1996).

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CULTIVATING A NEW RELATIONSHIP WITH FORESTS

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This symposium on natural forests and woodlands could not have come at a better time, when the Chief Directorate: Forestry is undergoing major review and realigning its strategies to address the fundamental issues of social development propounded by both the white paper and the National Forest Action Programme popularly known as the NFAP. Our Chief Director, earlier on, briefly touched on those changes. Today, this symposium marks the beginning of the new era in the management of natural forests which is about managing this resource for a much wider range of reasons including addressing needs of people. We are here to establish new relationships first, amongst ourselves as forest workers and/or researchers, but most importantly we are here to revisit our mandate and redefine the science of forestry to meet the requirements of the new policies.

In South Africa and in many countries, forestry has always sought to exclude people from effective decision making in managing the resource. Nevertheless, in SA this was further complicated by past racial policies that ensured skewed distribution and access to these national assets. However, in recent years there has been a significant change from approaches based upon exclusion towards participatory approaches which recognize the need to involve local users.

The shift in policy may have been as a result of realization that exclusion has largely failed to stop the rate of deforestation. Serious conflicts have been the order of the day between state officials and local people. In South Africa this was even worse because local people were at one point forcefully removed from these forested areas in the name of conservation. These methods of exclusion have increasingly became too expensive to maintain and run amidst low morale of the government officials. With this background many countries change their approaches from that of exclusion to that of participation and South Africa has recently adopted that approach. While other countries may be faced with many problems in implementing this approach, in South Africa this may well be even more problematic because of our past history.

Local communities are often distrustful of the motives of former enemies who now preach a philosophy of partnership. Similarly, the state officials may doubt whether the local communities who in the past poached illegally and over utilised forest resources, will really be capable or willing to utilise forest resources responsibly.

It is under these condition of entrenched racial hatred, political conflicts, mistrust, landlessness, unemployment and poverty that we should strive to build new relationships. Given the history of high demand on forest products which has not yet stopped and forests declining in area and quality, cultivating a new relationship with forests - the relationship that ensures conservation, sustainable use, and fair and equitable sharing of forests benefits offers a way out of this impasse.

The new relationship will necessitate some changes in prevailing attitudes and practices. The elements of new relationship include halting forest degradation and improving research and monitoring.

It is obvious that our research must also be responsive to these fundamental changes that forestry is undergoing and must integrate socio-economic and cultural aspects with technical forestry. Local people are not involved in research as yet. They are often perceived to be a problem from which forests should be protected rather than as potential clients for research. Already as we undertake to implement JFM policy we have come across many gaps in the state of our knowledge which can have serious adverse effect on these initiatives if not urgently addressed.

We have identified several priorities for research:

- We need research to identify economic and/or technological development that will trigger and maintain JFM programmes.

- We need to define and understand methods to estimate reasonable individual and community aspirations that are critical for enlisting participation in JFM.

- We need research to investigate the potential of non-wood forests products such as food, fodder, oils, resins, spices, fragrances, medicines, game meat and many more other products.

- We need research to improve marketability of these non-wood forests products. Special effort is needed to explore new avenues for efficient utilisation and marketing of products that have not yet been put to use.

- We also need research to develop simple but appropriate technology (which may integrate modern and traditional methods) involving low capital inputs for value addition to non-wood products such as those techniques that improve shelf-life for instance, but geared for local employment and enhanced income.

- We need research that will screen and introduce species producing high quality non-wood forest products such as fruit/nuts so as to enhance output and employment generation from forests.

- We also need research to address institutional issues that will lead towards favourable legislation for Joint ventures with local communities, including issues of land tenure and mechanisms for settling disputes. We are only too well informed about land claims and users demanding access from resources from which they have been unfairly excluded.

These are the research challenges facing us today and we strongly believe that these could be addressed jointly with the communities. Communities could be taught skills to monitor, record and compile sets of data that could then be passed on to specialists to analyze. The researchers would also monitor progress and provide necessary suggestions to the communities and they too must be amenable to suggestions from the communities who in many instances have lived with the resource for many centuries and would therefore avail their valuable indigenous knowledge.

In conclusion chairperson, the new relationship with forests must result in a win-win alliance of development and protection of the environment, which recognizes that socio-economic development and protection of the environment must be mutually supportive, and seeks to find ways of reducing conflict around sound environmental decision-making. Through this new relationship with forests we have the opportunity to reverse their decline, improve people's quality of life and ensure that future generations inherit healthy forests.

Finally I would also like to take this opportunity and thank you all for your time and dedication you have shown towards ensuring proper management of such an important resource. Your presence is a testimony of your commitment. I have no doubt that we are going to have a lively and fruitful deliberations.

SUSTAINABLE FOREST MANAGEMENT IN A NEW POLICY CONTEXT: *WHAT* HAS CHANGED?

Dr Coert Geldenhuys

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Introduction

Forest Policy context (NFAP):

- *Purpose:* to sustain the supply of goods and services (not only wood products) from our forest resources.
- *Goal:* to sustain forest development, now and in the future, to satisfy national and local goals and aspirations.
- *Forest resources:* that which would provide in people' s needs for development and their *aspirations* for a better life - including *a safe* and healthy environment (a Constitution guarantee). Depletion of *natural* forest and woodland resources *has* led to local *shortages* in the *availability* of their goods and services.
- *How:* development of diverse partnerships with shared decision making.

Guiding principles of Policy (White Paper) and Strategy (NFAP):

- Role of Government should be defined in relation to roles of other stakeholders, such as private sector
- Decisions and actions should take place at appropriate levels, i.e. individuals and organisations should act with greater autonomy, within the policy and law
- Cooperative governance, where national and provincial government need to address the forest sector together
- Most beneficial use of resources, i.e. balancing public and private interests, national and local priorities, and interests of the present and future
- Private initiative, in response to effective market forces, as the most efficient basis for gaining value from forest resources
- Need to incorporate in the forest policy those *measures* that would ensure a positive

relationship with other policies affecting the forest sector

- Legislation should be designed to support the implementation of policy by setting and enforcing minimum standards in the public interest, BUT by enabling local solutions wherever possible

- Policy should be designed to favour flexibility and diversity within anticipated change and *progress*.

Current Status of Forest and Woodland

- Landscapes with trees were reduced from 42 million ha (33% of land) to about 23 million ha.

- About 75% of indigenous closed forests, but only about 9,6% of the woodlands, are included in areas protected by law and owned by the State.

- There are forests and woodlands outside the proclaimed forest reserves, nature reserves, wilderness areas, etc. which are well conserved but which have an insecure conservation status.

- Reasons for loss of forest and woodland
  - Conversion of land cover to pastures and crops, both on commercial farms and for subsistence in rural areas
  - Indiscriminate use of fire
  - Unsustainable resource harvesting practices
  - Residential development in both rural and urban areas
  - Infrastructural development
  - Mining activities.

- Forest and Woodland expansion in several areas, through
  - Changed fire regime (as main disturbance factor)
  - Changed land use practices (game farming vs crop production)

Traditional and Current Resource Use from Forest and Woodland

Forests a traditional resource - traditional knowledge systems

Goods and services of use-value

- Timber for quality furniture, building and construction
- Wood for fuel and fencing
- Food from plant and animal resources
- Traditional medicines
- Crafts

- Horticulture and florist material
- Eco-tourism

Services of non-use value

- Conservation of biodiversity
- Soil conservation and improvement
- Water resource conservation
- Maintenance of the carbon cycle
- Spiritual, religious and cultural activities
- Aesthetics of the environment

Sustainable Forest Management

Definition:

'The stewardship and use of forests and forest land in a way, and a rate, that maintains biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and does not cause change to other *ecosystems.'*

The definition:

- requires policies that
  - integrate forests in rural development efforts,
  - balance environmental, economic and social needs among local, national, regional and global interests.

- has components of
  - Environmental health & stability
  - Economic efficiency & growth
  - Social equity.

Needs Satisfaction: Whose needs?

Basic needs vs higher-order needs

How do we move the poor rural *masses* from *subsistence* to sustainable commercial forest resource use?

What Has Changed?

A new vision for sustainable forest resource development has emerged! We have moved from an initial uncontrolled resource use, to forest protection, to scientific forest management, to a new vision for shared *sustainable* resource use.

What is the reality at local level?

Scientific and sustainable management (of world class standard) of forests on state land and protected areas is practiced to satisfy higher-order needs and aspirations (quality furniture, eco-tourism, florist greenery, scenic beauty) of the affluent society.

Rural population demography and socio-economic constraints increase pressures on existing resources. The main underlying reasons are

- Ineffective land tenure *systems*
  - Breakdown of rural traditional *systems* of control
  - Conflicts between government and 'illegal' resource use by rural community needs driven by poverty

- Population growth and demography
  - Urbanization
  - loss of local indigenous (traditional) knowledge
  - Population growth and poverty - pressures on resource use (Many examples of poverty-driven action which cause continued resource degradation)

- Lack of local business and marketing skills - misuse of local intellectual property

- Lack of funds in government institutions to effectively control and/or facilitate local resource use

Potential Models for Sustainable Forest Management in South and Southern Africa

Urgent needs:

- to develop and introduce new systems of forest management to sustain resource use for the socio-economic benefit and improved livelihood of rural communities.

- to commercialise & domesticate forest and woodland products in support of SMME's.

Some models to consider:

Southern Cape as a Model Forest of integrated resource management

Soutpansberg Complex: Biosphere Reserve Concept

Woodland management in Mpumalanga Lowveld: development of a *Cooperative* based on the Rumohra fern model to integrate conservation and sustained utilisation of target species such as Kiaat *(Pterocarpus angolensis)*

Southern Cape as a Model Forest of Integrated Resource Management

Multiple-use approach (historically no rural people dependent on forest resources)

- Timber harvested in sophisticated, scientific-based single-tree selection system which is sustainable and timber prices governed by supply-demand which reflect scarcity value
- Fuelwood produced from 'waste' wood
- Lucrative fern industry based on forest production potential and excess needs produced outside forest in small industries
- Recreation & Ecotourism facilities - part of Garden Route
- Nature reserves and protected areas

HOWEVER, there is room for building of diverse, consensus-driven partnerships with local institutions, organisations, communities and individuals, working with shared decision-making to achieve greater environmental, social and economic sustainability in forest resource management:

- incorporation of fynbos vegetation and privately-owned forest in the 'Model Forest'
- facilitation of greater involvement of industry in development of the timber, NTFP's and ecotourism potential
- involvement of interested entrepreneurs amongst local 'disadvantaged' communities to develop SMME's, such as
  - Bark for traditional medicine
  - Crafts based on timber and non-timber resources

***Rumohra* Fern Model** - used as greenery in florist industry

- Conflicts in resource use were resolved by implementing joint resource management between:
  - industry (fern harvesting),
  - forest managers (monitoring & control)
  - scientists (adaptive management research approach)
- Harvesting fern leaves from forest was limited to sustainable levels, but harvested area increased from 4 000 ha (1982) to 20 000 ha (1994)
- Extra market needs were produced from cultivation in forest, pine-stand, and shade-cloth nurseries outside forest on farms

- A Farmer Cooperative developed to support production, packing and marketing (exporting)
- Small forests on farms better protected: not cleared - used to grow planted fern in understorey with irrigation
- Extra job opportunities for several hundred farm worker families
- Direct revenue for DWAF and independent farm-based fern industry

Woodland Management in Mpumalanga Lowveld:

Development of a Co-operative based on the *Rumohra* fern model to integrate conservation and sustained utilisation of target species such as Kiaat *(Pterocarpus angolensis)*

PROBLEM: Kiaat is a multi-purpose tree which is widely used in the area. Limited local sources become depleted which concern environmental conservation authorities

NEED: to implement joint resource management strategies

- to reduce conflict between the local communities and the conservation authorities,
- to develop sustainable SMME's based on these potentially commercial products as a *basis* for cooperation and socio- economic development,
- to improve conservation of the areas based on better understanding of sustainable *resource* management.

PROPOSED STRATEGY:

- *Assess* the Kiaat *resources* in target *areas (reserves,* communal land, forestry areas, farms, etc.)
- *Assess* the socio-economic use and value of Kiaat by local communities
- Develop local business groups which deal with resource harvesting, wood carving, marketing and sales on a cooperative basis so that most of the financial benefits remain in the local community.
- Develop local sustainable joint *resource* management *strategies,* between the conservation authorities and the local *business* group - based on the total resource in target area
- Training and capacity building; SMME's, marketing resource management.

Conclusion: Requirements for Sustainable Resource Use

- Resource inventories & zonation (composition and resource status and potential)

- Ecology of key ecological and economical target species
  - Population dynamics
  - Biophysical site relations
  - Key constraints of life cycle [development] stages
  - Eco-physiological requirements
  - Rates of recruitment, growth & mortality

- Ecology and status of the vegetation in which the species occurs
  - Key ecological processes
  - Species composition in different development stages
  - Harvesting impacts

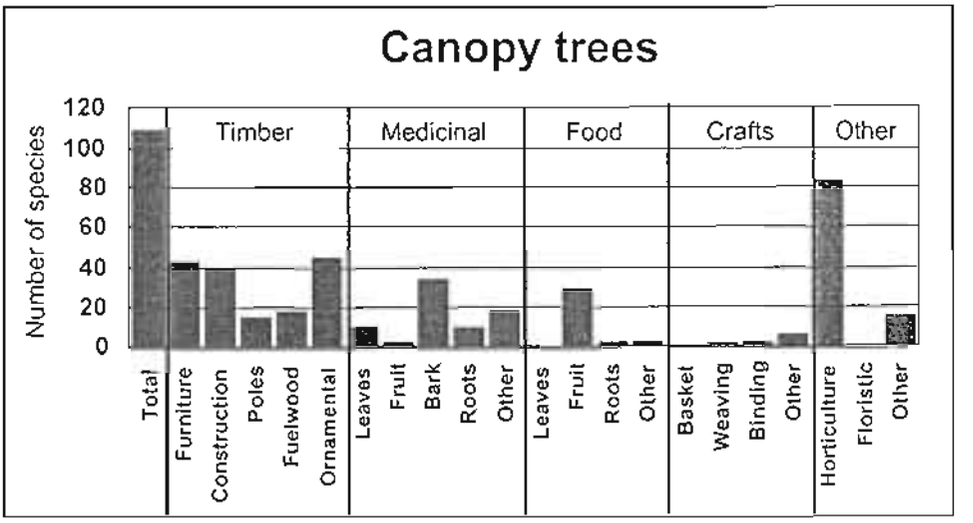
- Socio-economic value and use of the species, including
  - local indigenous knowledge of species (names, why specific *uses)*
  - traditional practices of resource harvesting
  - local benefits
  - market needs

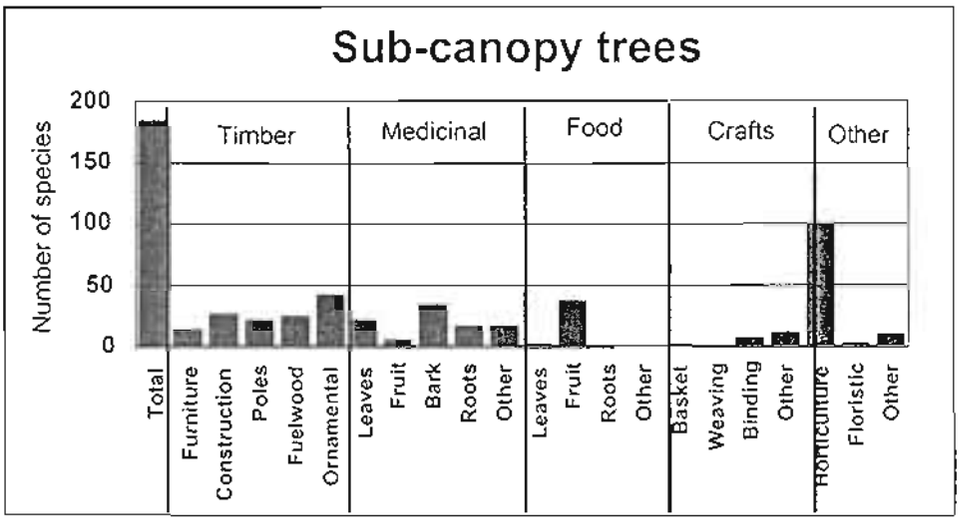
- Institutional Framework for Joint Resource Management: capacity, representation and functions

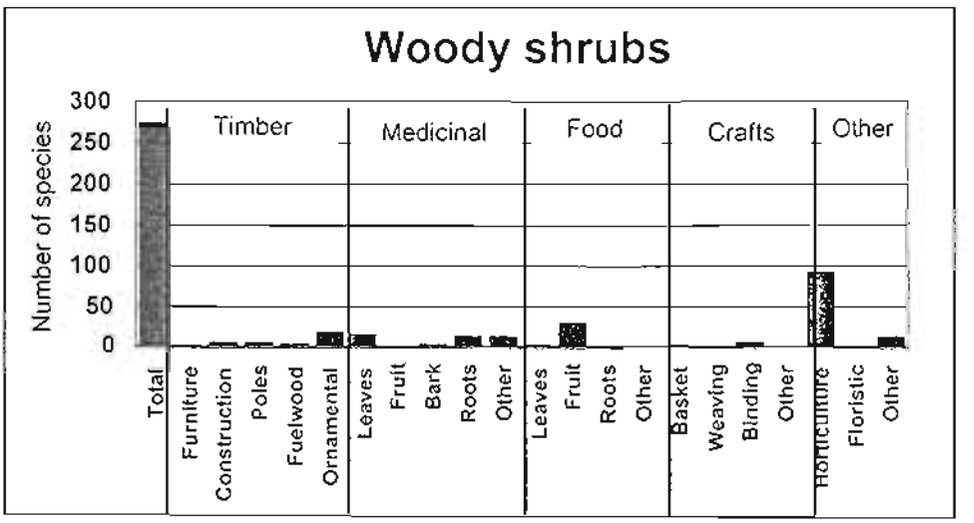
- Alternative production and restoration systems

- Monitoring of resource use impacts

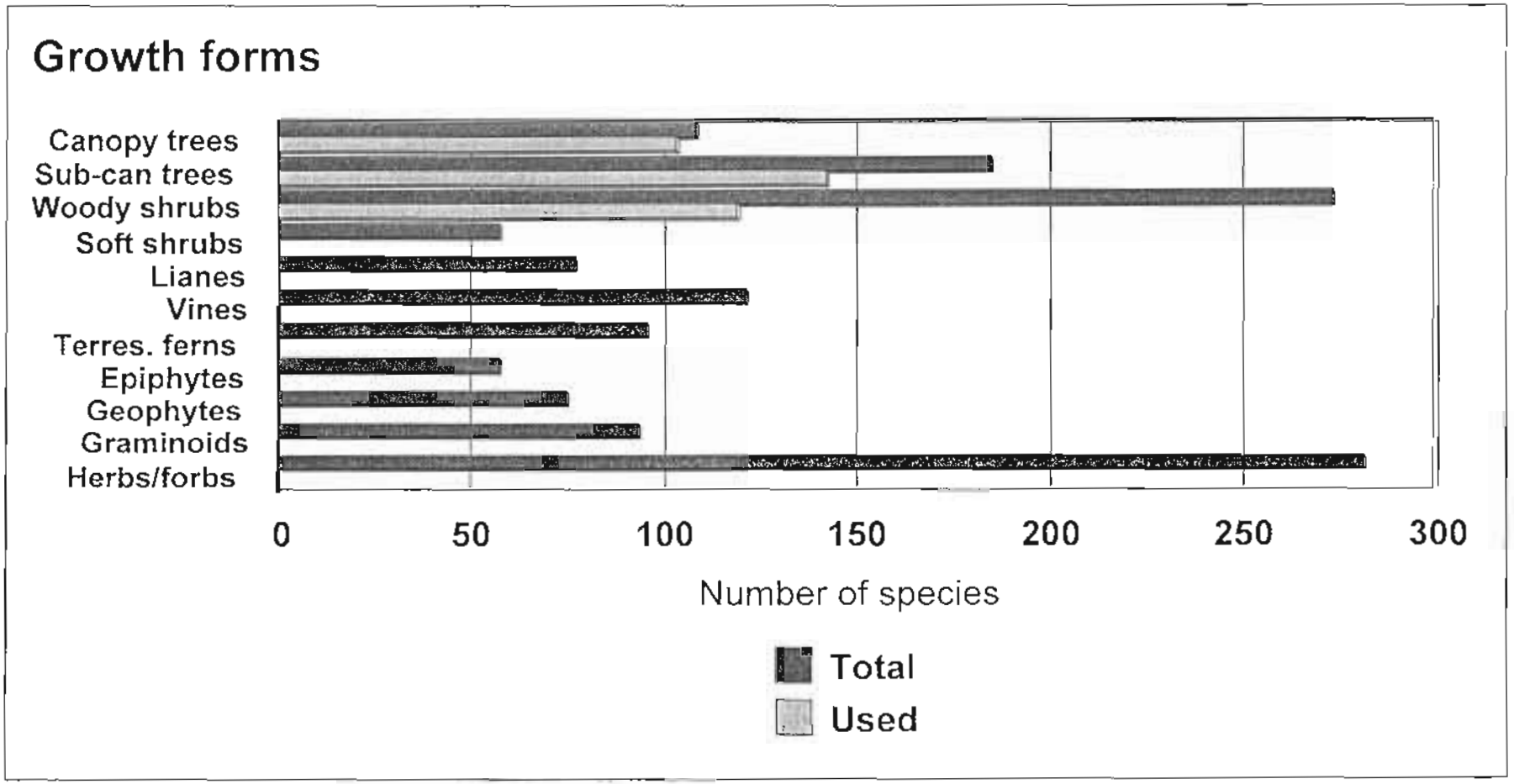
- Ecological and socio-economic research approach and programmes



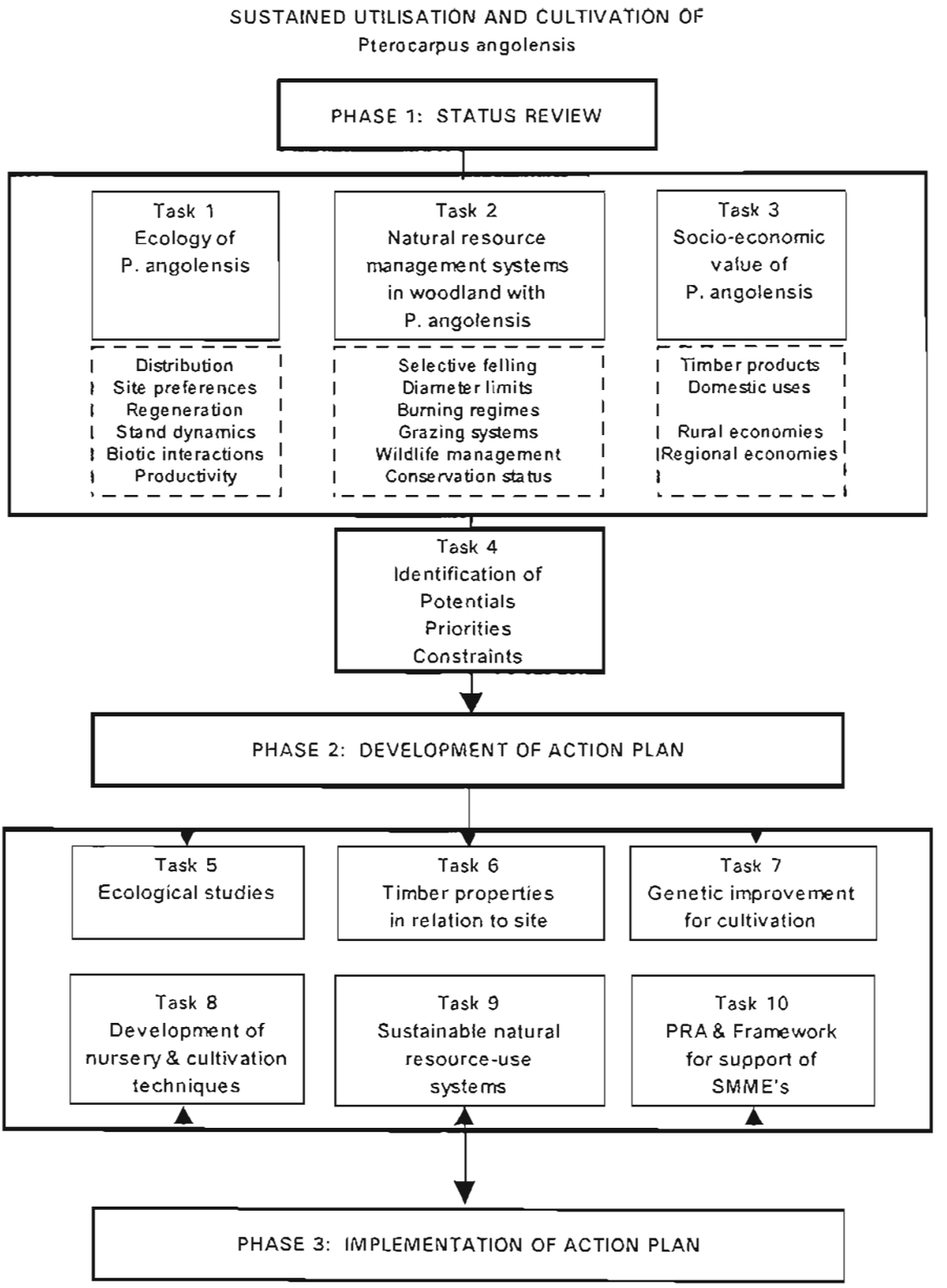




Number of tree and shrub species in the South African forests which have been or are still used, traditionally and/or commercially, according to Palmer & Pitman (1972)



Forest composition by growth forms (1430 species), after Geldenhuys 1992, and number of species with use value (only trees and woody shrubs), after Palmer & Pitman 1972.



Flow diagram of an integrated research approach to conservation, sustained utilisation an domestication of a useful woodland species, *Pterocarpus angolensis*

EXPLORING MARKET AND NON-MARKET INCENTIVES FOR SUSTAINABLEWOODLAND MANAGEMENT IN ZIMBABWE: SAFIRE'S MITI PROJECT

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Introduction

As foresters, we tend to advocate for the sustainable management of trees and everything to do with trees. Why? Because they are the basis for our livelihood, and nothing could be a greater incentive for sustainable management. But the proportion of trees directly under the control or influence of foresters is almost infinitesimal. What about the rest of them? What incentive does anyone have to manage them sustainably? More particularly, what incentives do the rural peasants of southern Africa, embroiled in their own unending war on poverty, have to manage trees sustainably?

Poverty and land degradation in Zimbabwe

The interrelationships between poverty and environmental degradation have become starkly apparent in rural Zimbabwe. More than 70% of Zimbabwe's population derive the bulk of their income from agriculture. Yet the resource base from which this livelihood is derived, land. is in steady decline. They are locked in a cycle of ever- increasing poverty and degradation.

The government of Zimbabwe, and indeed many of its local and international advisers, believe that export-oriented macro-economic interventions (specifically structural adjustment) will break the poverty-degradation cycle by reducing the economy's dependency on agriculture and its products. However, there are several dangers in this strategy. There is only a narrow range of products that Zimbabwe can export without degrading the natural resource base; the number of alternatives that do not depend on heavy external inputs is limited; and there are no safeguards against excluding poorer sections of rural communities in these strategies.

Ironically, when the government is trying to reduce dependency on agriculture, it is from agriculture that the country continues to derive many of its exports. As such, the macro-economic environment has been created that heavily favours cash cropping.

There are obvious contradictions in the notion that export-oriented cash cropping can serve as an engine for Zimbabwe's economic development. It is, especially in the more marginal lands in which many of the rural masses live, this very dependence on cash crops that is pushing the land into ecological decline. Trees are cleared for crops, soil is lost into the waterways, crop yields decline and the cycle continues. Sustainable management of woodlands would clearly be more ecologically

preferable, but are there incentives for rural farmers to manage trees in an economy geared towards cash crops?

SAFIRE (Southern Alliance For Indigenous Resources), a Zimbabwean NGO working in communal lands along the country's eastern border, believes that there are. A greater diversity of rural livelihood options, whether based on the land or other resources, is obviously highly desirable. Trees and their products provide a range of livelihood options that are not currently being exploited.

The MITI project

MITI (Managing our Indigenous Tree Inheritance) is pilot project of SAFIRE's, located in five districts along the border with Mozambique (Rushinga, Nyanga, Chimanimani, Chipinge and Chiredzi). The project seeks to promote economic development in rural areas based on sustainable and productive use of natural resources. The primary focus is on woodlands and trees, these being the most widely available natural resource in the country's communal lands.

MITI's basic premise is that natural resources, and particularly woodlands and trees, have enormous potential to contribute to economic growth in communal areas, providing the environment can be created in which farmers have the incentives to invest in management of these resources. It further believes that those incentives are basically there, in the form of the economic, ecological and socio-cultural benefits that stand to be gained from sustainable resource management.

Towards the creation of an enabling environment for sustainable management, MITI seeks to:

- promote access and user rights of local communities natural resources;
- empower communities with the operational and technical capacity to initiate and implement appropriate resource management activities;
- develop and promote local level enterprises based on sustainable natural resources management;
- strengthen the capacity and skills of Rural District Council staff and Councillors (i.e. theZimbabwean local government authorities) on issues pertaining to natural resource management; and
- support at the local, district and national levels the adoption of policies and regulations that facilitate sustainable natural resources management.

Natural resource-based enterprise development

Perhaps the most important incentive for sustainable management of woodlands by rural communities is their ability to derive a livelihood from these woodlands. Thus MITI has extensive emphasis on the development of natural resource-based enterprises.

The first step in MITI's strategy was to conduct an 'ecological scoping' exercise in each District to ascertain the level and range of available natural resources, as well as to assess the interest in the project at all levels. From this, 'clusters' of resources which could be exploited by the rural

communities were identified. With community involvement, several pilot clusters were chosen and communities in these areas were asked to submit proposals for possible enterprise and resource management activities. This is an on-going process, with the resources being assessed by SAFIRE before groups or individuals are encouraged to develop concrete business plans for submission to the RDC.

The variety of resource utilisation options emerging from these scoping exercises has been encouraging. From traditional woodland based enterprises like beekeeping, basketry and craftwork, through to more innovative options such as ecotourism, fruit-based alcoholic beverages and butterfly farming, there have been no shortage of ideas arising from the communities in which scoping took place.

Resource management activities are funded in one of two ways:

1. Group or individual loans for natural resource enterprises (District Environmental Loan Guarantee Facility). This is a facility through which SAFIRE and the Rural District Council underwrite loans to entrepreneurs through a commercial bank. Funds lent belong to the bank, but collateral, provided by SAFIRE, belongs to the RDC and is invested with the bank. Interest on the collateral investment is used to subsidise the loan, such that entrepreneurs are repaying at 25% interest as opposed to the 38% normally charged by the bank.

2. Grant funding for community groups (District Environmental Funds). A special fund is housed with the RDC to fund activities such as village resource management strategies (particularly rehabilitatory programmes) and participatory technology development for new enterprises, from which no immediate monetary benefits can be expected. Applications for finance from this fund are assessed in a similar manner to the loans, but do not need the bank's approval. Although the finance originally comes from SAFIRE, the fund is managed and controlled following standard RDC procedures.

In addition to facilitating access to finance for entrepreneurs, MITI also provides direct training to entrepreneurs in a range of business and technical skills.

Institutional capacity building at village level

Funds for natural resource enterprises and management activities are not enough on their own, however, and MITI is making a significant investment in developing village level institutional capacity for sustainable resource management.

In principle, the MITI project aims at combining production, management, authority and benefits at community level. However, in practice, the law delegates proprietorship and responsibility for resource management to RDCs who are neither producers nor managers of the resources. This poses interesting challenges to MITI in terms of institutional development at local level, access to resources and conflict management. This is further complicated by the possible placing of differing values on common property resources by different users. A spring may be valued for its spiritual significance by one group while a neighbouring community may place more value on its utilisation as source for domestic and livestock water. Thus granting of rights to one group in this case would

inevitably compromise the other.

Thus MITI take the "whole community " approach to such issues with the hope of minimising conflicts over access and ensuring that the vulnerable groups, including women, are not left out of the development process altogether. This has been achieved through training and facilitating the drafting of by-laws and regulations for inclusion and exclusion at local level, trying to ensure that the rights of disadvantaged groups are enshrined within these by-laws and regulations, and developing the skills of village level institutions in participatory project planning, implementation, monitoring and evaluation.

Institutional capacity building at RDC level

A central concept to the MITI project is the development of district level capacity for planing and managing natural resources. One of the major factors influencing this is the level of skill and capacity within RDCs to plan, implement and manage natural resource-based projects. The other is the difficulty in linking traditional and modern government structures both horizontally and vertically.

Capacity building activities at district level take place in three different fora:

- the RDCs' Natural Resources Committees (composed of elected councillors). These are the district level legislators, and thus key to the development of enabling policies for natural resource management within the districts;
- the RDCs' executive staff, employed to run RDC affairs. Within these, MITI has supported the creation of a post for a natural resources Projects Officer, and is now training the incumbents; and
- the "District Team", composed of all technical staff at district level from government, NGOs and RDCs tasked with activities related to natural resources.

SAFIRE has provided extensive training to all of these groups. Participatory project planning and implementation, Freirean principles of community development, interpretation of the national laws governing natural resources, financial management, and natural resource assessment and inventorying have all been included within the training activities. As the project evolves, so further, more locally specific training needs are expected to arise.

National level policy initiatives

The national policy environment is also a target of MITI. On several levels there are strong needs for policy reform, particularly with regard to land tenure, local governance structures and agricultural subsidies. Recognising its limited ability to influence national policies, MITI is nevertheless attempting to ensure its lessons are not lost. Examples of good practices at the local level are being documented within the project, and systematically circulated to policy makers as part of a co-ordinated lobbying strategy. At the same time, SAFIRE participates widely in policy fora through which it can seek to exert influence, and the MITI project has a national Steering

Committee, comprised of senior officials from several Government departments, that also serves as a body for channelling lessons and recommendations.

Implications for research, policy and practice

The above is a brief description of how one project in Zimbabwe is seeking to realise the incentives for sustainable woodland and natural resource management by communal farmers. The description is far from exhaustive, and the project's scope itself remains limited. However, MITI has already provided a number of useful indicators as to how market, and to a lesser extent, non-market incentives might be encouraged. Inevitably there are still more questions than answers, but these questions help define a research agenda through which they may, one day, be answered. This section outlines some of the questions arising.

One set of questions relate to the possibility of developing strategic and mutually beneficial partnerships between communal producers and the commercial sectors. For instance, would it be possible for commercial traders to get involved in outgrower schemes for natural resource-based enterprises (e.g. on fruits for commercial alcohol production)? Are joint partnerships between producers and retailers possible, in which producers can actually assume share holding status in the marketing company?

Considering the very real attraction of "green marketing and the so-called eco-labelling, it is also pertinent to ask what are the options for using communal, ecologically sustainable production systems to actually enhance the marketing of products by the commercial sector? What technologies (eg fruit drying) can communities use to add value to natural resource-based products *in situ* before they are resold by commercial buyers?

One set of non-market incentives relates to using fiscal incentives (taxes or tax breaks) to encourage communities to manage natural resources sustainably. This approach is widely used in Europe and North America, for instance but less so in Africa. What options are there for applying fiscal incentives within the rural African setting? Similarly, if agriculture is subsidised, why not CBNRM? Conversely, if it was indeed subsidised, what form would such subsidies take?

There are also a whole range of cultural incentives. How can these be promoted? How can indigenous knowledge systems be integrated within modern land use planning? How can extensionists actively promote traditional practices that are ecologically sustainable?

These, and many more, questions remain to be answered. MITI is a small drop in a very large ocean. It has the advantage of building on the experiences of many other small drops before it (notably Zimbabwe's CAMPFIRE programme), but it remains a drop. Nevertheless, as we learn lessons through MITI, and as others learn lessons through their own experiences, we are steadily able to gain a better grasp of why people do, and do not, manage resources sustainably, and of how we can promote positive incentives for sustainable management. As foresters, our livelihoods may well depend on our ability to promote such incentives!

INSTITUTIONAL ARRANGEMENTS FOR SUSTAINABLE WOODLAND MANAGEMENT IN COMMUNAL AREAS

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Introduction

This paper will attempt to look at institutional arrangements governing woodland and forest management of communal areas within South Africa. It will start by looking at some of the history leading to the current situation. This will be followed by a description of current institutional trends impacting on resource management. The need to better understand how to achieve sustainable resource management within communally managed areas will be justified. Current international and local experience for achieving sustainable common property management will be reviewed in terms of the current South African realities. Finally suggestions will be given for institutional support to enhance sustainability of resource management.

Historic Perspective

Prior to white colonisation of South Africa, resource management issues were dealt with through tribal structures and systems. Much tribal law and belief was aimed at governing resource use and this undoubtably lead to greater sustainability of resource use. Historically the woodland areas were an area that was extensively colonised by Bantu tribes and there has therefore been a long period of co-evaluation relating to the management of the woodland resource. Although acknowledging the great importance of traditional knowledge, we should however not over romanticize its value in resource use because there is growing evidence that even traditional Bantu resource use systems led to over exploitation at the local level. In historic times this was however not serious as land was not as limiting a factor and people were able to move to new areas, or open new fields in a form of shifting cultivation - a land management option that is no longer available (Hall 1987, Kruger 1998).

Post-colonisation, there was a movement toward dividing the landscape into different ownership areas. Three distinct types of rural land use and ownership where established in the forest and woodland areas.

- **Private land** which was almost exclusively white owned and was initially used primarily for farming. Over time private (non-state) forestry and game ranching has also become a common land use. Ecotourism based on game farming is a very important land use within the woodlands. Private land use will be excluded from further discussions except for comparative purposes.
- **State land** which was used for conservation, forestry and other purposes such as defence. Typically conservation departments such as the South African National Parks Board and

provincial conservation departments or boards have been responsible for woodland conservation in conserved areas. Forest and catchment conservation has been the domain of the Department of Forestry. Much of the state commercial forestry land was effectively privatised with the formation of SAFCOL.

- **Communal land.** Land on which black communities lived in some form of communal tenure. This land was eventually consolidated in the formation of the Bantustans. It should be pointed out that traditional resource management structures where largely destroyed during this process. The homeland structures were politically dismantled in 1994. The ex-homeland areas are however still distinct from other rural areas in the country because of the communal nature of their resource tenure.

The most recent impact on management of woodland and forest areas is the transformation taking place as a consequence of post apartheid policy changes. New government policy is impacting on almost all government departments. The White Paper on Sustainable Forest Development for the first time places management of woodlands as a direct responsibility of the Department of Water Affairs and Forestry.

By far the greatest change will come from the land reform process. This will impact on woodlands in a number of ways, including redistribution of private and state owned land to communities, and the transfer of land that was removed from communities without due compensation back to the communities. In addition tenure reform will entrench community's rights to the resources. It is quite probable that 50% or more of all rural land will be owned and managed through some form of communal tenure in the future. State departments such as conservation and forestry are also looking to revise management strategies where communities adjacent to conservation areas will share benefit and have a say in management of conserved areas through Joint Forest Management (JFM) or Community Based Conservation Management schemes.

Institutional Arrangements Governing Management of Communal Areas

The ex-homeland areas of South Africa comprise approximately 13 % of the country's land area. Although some of this area is managed as state land, the majority falls under traditional communal tenure. This will be referred to here as the communal areas. A high proportion of the communal areas are within the woodland areas of the country. Rutherford and Westfall 1986 estimate that 90% of the area set aside for black settlement within South Africa and Namibia is within woodland areas.

It is important to note that communities are situated directly within the woodlands. Areas of woodland may be cleared for housing and agricultural fields, but the main commonage area remains as woodland. This differs significantly from forests which are normally either excluded from the community and made into a forest reserve, or which form small patches in the commonage that the community lives adjacent to. Unlike many other developing countries, in South Africa it is very rare for communities to actually live within forests. Forest reserves and

conservation areas may be directly adjacent to communal areas. In some instances sections of the communal areas have been leased or expropriated from the communities to form these conservation areas (see figure 1).

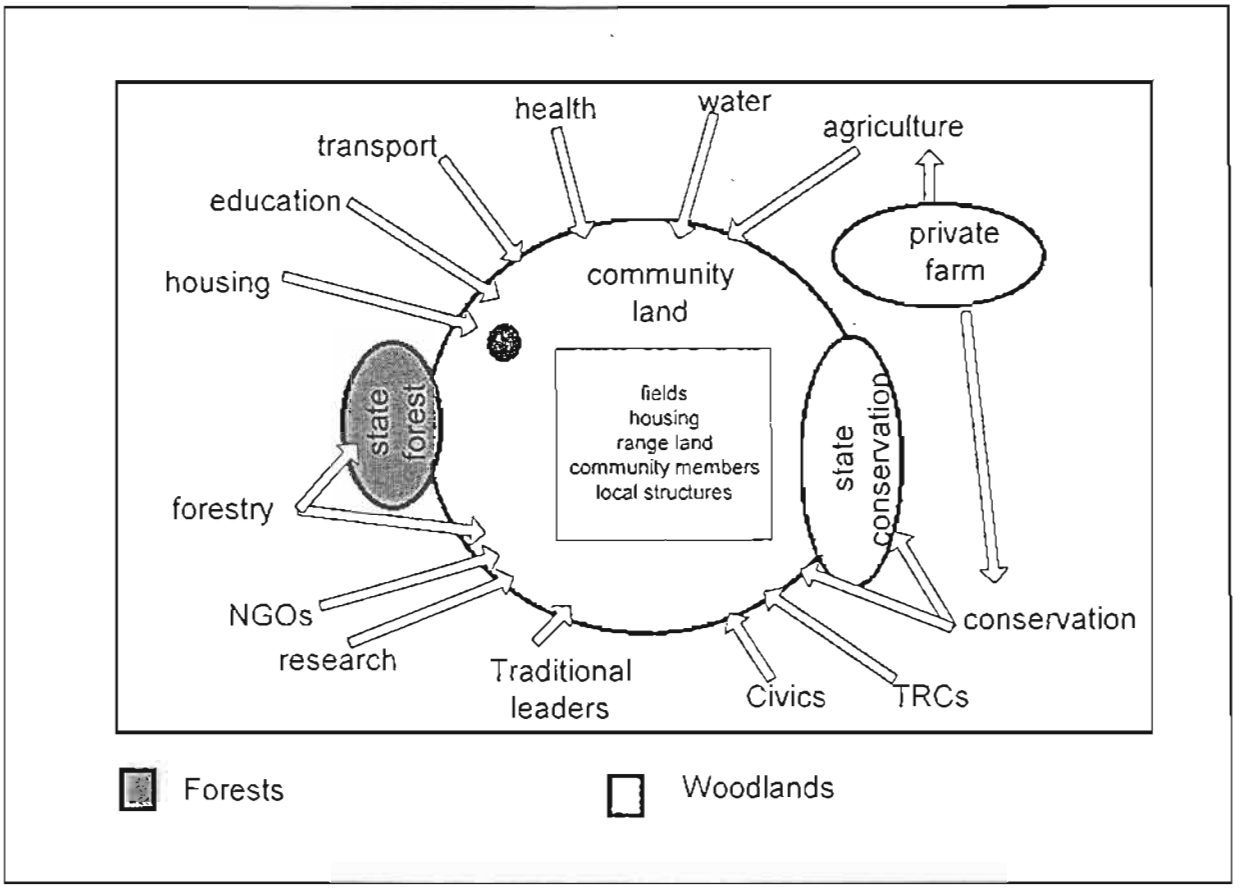

Figure 1. The relationship between communities and forests and woodlands. Note that communities often live within the woodland while forests are either small patches or state owned, and as such are spatially removed from the community. The diagram also indicates the complexity of institutions that are impacting on the community while providing support and services. In the case of private farms, the initiation of support is farmer driven, while on communal land it is driven by the departments (though this approach is starting to change). The goals, reasons for involvement and approach varies greatly between different departments and other role players.

Management and tenure within the communal areas is complex. Traditionally the chief was largely responsible for management controls. Although this is still true, a lot of the chiefs authorities has been eroded, both through formal legal structures such as district magistrates and through the erosion of adherence to traditional authority. Many customary rules govern woodland use. There are controls over opening of new fields, cutting of trees collection of fruits, harvesting grass, grazing cattle etc (Evans *et al* 1995)

There is no co-ordinated institutional support for management of the woodland resource within the communal areas. Instead the community is subjected to a vast number of organisations that have some form of mandate to be involved in community issues. Some of the departments involved such as the Department of Forestry, the Conservation Department and the Departments of Agriculture have very direct mandates regarding woodland management. In addition there are a multitude of other national departments, provincial departments, local authorities, NGOs,

researchers and other institutions with a mandate to work with the communities for broad development purposes (see figure 1). In many instances the activities undertaken by the organizations may overlap significantly despite the fact that each organisation has its own mandate and goals. These may well be contradictory in nature though most have some form of development support as an underpinning principle. Quite which organisation becomes truly active within a given community will vary from community to community. Given all the potential role players, one might assume that communities are well supported from outside institutions. Historically this has however seldom been the case. Confusion of roles and lack of good co-ordination, both in objectives and implementation is probably largely responsible.

A major problem relating to the multi-institutional support to communities is that each organization deals with its specific mandate and works with sub-sections of the community. With the exception of a few NGO's non of the organisations tackle the fundamental problem that there is no strong local community institution able to regulate and control the inputs from outside organisations and plan local resource management strategies. As will be demonstrated later the existence of such institutional arrangements is critical for sound resource and community management. The multi-institutional involvement in communities may in many cases actually hinder the formation of sound community based structures. In essence communities should be treated in a similar manner to private farmers.

Communal areas and private farmers receive a very different type and level of service. Private farms fall under the regulation of departments such as the resource conservation directorate of the Department of Agriculture, but institutional services to farmers is largely initiated via a request for a service from departments such as agricultural and forestry extension. These services are provided on request of the farmer and directed to meet the farmers expressed needs. In addition co-operatives act as an organising mechanism for farmers interests. Contrary to the situation on the communal areas, the private commercial farmer largely determines his own fate, and is almost solely responsible for the management of his farm and woodland areas. Provided that he adheres to statutory regulations he can manage his farm as he wishes.

In the communal areas, enforcement of management practices is extremely problematic, and although communities and commercial farmers are theoretically subjected to the same regulations, enforcement within a communal context is extremely difficult. Most support is in terms of extension support, and in some instances service provision. New government policy is resulting in most departments scrambling to demonstrate relevance within communal areas. Unfortunately there is limited inter-departmental co-operation and there is a lack of a clear co-ordination mechanism. It could be argued that the communities have been, and remain, dis-empowered in the process since they are often treated in a paternalistic fashion and have been given no clear ownership and mandate to manage their own resources. In many instances the resource is, or was in the past managed on their behalf. Use of the resource has moved in many instances to a system of free access with individuals, both from within the community living on the resource, and from outside communities, accessing the resource as they please.

There is a clear sense from most government officials that the communal areas are suffering from 'the tragedy of the commons' syndrome (Hardin 1988). However there is good evidence that it is management practices, and not group ownership, that leads to resource degradation within communal areas. Institutions supporting resource management in communal areas need to

understand the distinct conditions that lead to successfully resource management. Fortunately there is extensive learning from other countries and locally on likely conditions for successful group management of resources.

How Should Communal Areas Be Managed?

It must be emphasised that regardless of individuals personal beliefs around the merits of privatisation, group ownership of resources will remain, and indeed increase in the foreseeable future. Group ownership is firmly entrenched in the land reform process of the Department of Land Affairs, and much of the redistribution and restitution process will lead to increased land areas under communal tenure. The tenure reform process is more likely to concentrate on the entrenchment of tenure rights rather than lead to a change from group to private tenure. It is therefore important that we find ways to ensure sound resource management of our woodlands given that they are being managed under some form of group tenure.

Shackleton (1998) has reviewed criteria for successful common property resource management. The following criteria are taken directly from Shackleton and discussed within the South African context. As will be noted, most criteria deal with institutional structure, security of tenure and appropriate institutional support.

Conditions Conducive to Successful Collective Action - Theoretical Model

1. Nature of the resource

Specific variable/ condition	*Definition & theory*
1.1 Boundaries	Resource boundaries must be defined & distinct.
1.2 Resource size	A resource with small boundaries is easier to manage and monitor.
1.3 Ecological properties	Rapidly renewable resources are easier to manage than slow-growing resources.
1.4 Supply-demand conditions & degree of dependency	High levels of dependency and resource scarcity will result in more effective control as resource users become conscious of the need to manage the CPR.
1.5 Indicators of CPR conditions	Reliable indicators of the condition of the CPR are important for raising awareness amongst resource users of the impact of individual and collective action.

In the South African context, boundaries are a contentious issue that needs clarification. Forced removal and betterment policy resulted in boundaries that are not uniformly accepted by community members. A breakdown in the homeland system and traditional rules has also lead to opportunistic disregard for old boundaries. The tenure reform process will however provide a perfect opportunity for re-establishment of firm and clearly definable resource boundaries.

Resource areas in South Africa are currently relatively large, and it is not clear at what scale tenure reform will take place. Consideration of this principle should be carefully considered during a

tenure reform process. Keeping an area sufficiently large to provide sufficient habitat for sustainable grazing practices may also be important. As a rule of thumb it is likely that the size of the resource area will increase increased aridity and reduced soil nutrients.

Although natural resources have great value to communities, there is less direct reliance on the resources as the only means of subsistence compared to other African nations. This may have potential negative impacts on establishment of sustainable resource management regimes.

2. Resource users

2.1 User group size	Costs of communication & decision-making are lower, rules are easier to enforce, and social sanctions more effective in small groups. Greater community identity and sense of mutual inter-dependence.
2.2 Residence	More favourable if users reside in close proximity or in the resource.
2.3 Membership & eligibility	Members of the group with ownership and/or access rights to the CPR must be clearly defined and agreed conditions for eligibility should exist.
2.4 Degree of homo-geneity	Greater homogeneity favours collective action. There is better cooperation when resource users are not strongly divided by different conflictual use patterns, different perceptions of the risks of extraction, cultural antagonisms, dependency on the resource.
2.5 Prior experience in collective action	When a community has had repeated experiences of successful collective action then positive attitudes to cooperation tend to be conveyed through myths, customs & sayings which favours successful CPRM.
2.6 Local understand-ing & knowledge of the resource	The perception that the benefits of collective action exceeds the cost is more likely to arise when members have full and accurate information on the nature of the resource, the impact of withdrawal and the supply-demand situation.
2.7 Degree of mutual trust & reciprocity	Users need assurance that if they change to more costly, joint strategies others will also.

The resource user groups within South Africa have undergone changes that have lead to a breakdown or erosion in many, if not all of the above conditions. Communities are typically large, with a mix or residency and migrancy. There is also evidence (Cross et al) that there is a lot of flux as rural households move between different rural areas seeking better livelihoods. Although traditional knowledge of resource management exists it has been destroyed through imposed regulations and a movement to a more urban lifestyle. Many rural areas are currently in a great state of turmoil with discontent between traditional and newly forming democratic local structures and resource management is as much a political tool as a practical necessity.

3. Institutional issues

3.1 Ownership status	The rights that users have to access, use and to exclude others from a CPR should be certain sustainable Resource users must be able to sustain legal claims as owners of the resource. Without this outsiders cannot be effectively excluded.
3.2 Presence of local organisations	Emergence of effective CPRM institutions is most likely where resource users have had some prior experience in organisation.
3.3 Centralisation	Some form of representative centralised control at a local level is often necessary to ensure effective sanctions for rule infraction.
3.4 Authority systems	CP regimes depend on an effective system of authority to legitimise & enforce user rights & operating arrangements. Local institutions can rarely stand alone.
3.5 Adaptable institutions	A CPR institution that is able to change its rules and the incentives and sanctions to be used has a higher probability of surviving in a changing environment than one that is inflexible .
3.6 Nested institutions	Nesting user groups in federated structures overcomes the problems of large user groups and contributes towards addressing questions from outside the user group boundary.
3.7 Leadership	A good leader or co-leaders to direct and champion the cause can contribute considerably to success.
3.8 Conflict resolut-ion mechanism	Simple &low costs mechanisms for conflict resolution essential.
3.9 Relative power of sub- groups	Chances of success are improved when those groups benefiting from the commons are more powerful that those who favour private property This may mean bringing the elite on board..

There is serious breakdown in appropriate institutional structures for sustained resource management . No ownership, or a low sense of ownership is particularly problematic, but will hopefully be dealt with through the tenure reform process. More problematic is the breakdown in management and authority structures, rules and regulations.

4. Nature of rules, regulations & sanctions

4.1 Source of rules	Rules & regulations should be locally derived, build on customary systems and beliefs, and be agreed upon by resource users.
4.2 Flexibility of rules	Regulations should be flexible to accommodate times of stress, annual variation, and exceptional circumstances
4.3 Simplicity of rules	Rules should be simple so that resource users can remember them and transmit them to others. The fewer & less ambiguous

	the rules the higher the agreement amongst participants about what is and is not an infraction.
4.4 Achievable & realistic rules	There must be congruence between withdrawal and management rules and local conditions.
4.5 Sanctions & punish-ment mechanisms	Clearly understood systems and mechanisms of sanctions & punishment for rule infringement must exist.
4.6 Graduated sanctions	Resource rule infringements should be assessed according to a graduated system of sanctions depending on the seriousness of the offence
4.7 Rules enforced & monitored	Monitoring activities and rule enforcement are an essential component of a CPR management system. If monitoring is lax, sanctions may not be applied, & the CPRM system will not be effective. A combination of formal & informal monitoring is most effective.

It would seem that effective rules and regulations, and mechanisms to develop and maintain these are lacking in most communities. Although traditional rules exist, these have often not adapted to current realities. Mechanisms to allow for the evolution of rules seem to be lacking. Conflict between traditional structures and new emerging democratic structures is also a problem. Resource use rules are often low priorities to new democratic structures. These structures also oftenoperate at the wrong level for effective rule making and regulation.

5. Economic issues

5.1 Incentives	Effective CP institutions will not emerge unless the perceived benefits of organising & complying to rules exceeds the perceived costs. A viable common property regime has a built in structure of economic and non-economic incentives that encourages compliance.
5.2 Benefits accrued	Benefits should be equitably distributed to all rights holders.
5.3 Value of the CPR	Commonly argued that the greater the economic value of a CPR, the greater the incentive for collective management to conserve it.

Economic benefits from woodland resources are poorly understood, though it is probable that communities are under-estimating the true value of these resources. This is partly because South Africa overall is a cash based society, whilst most woodland resources are used in a more subsistence driven manner. It would also appear that there is not equitable access and sharing of benefits from resources.

6. Policy issues

6.1 Characteristics of the legal & political environment in which the users reside	For common property to be effective the state must be willing to recognise and protect the rights of people living under a CP regime, and should respect local community organisation and control, and permit and facilitate its development.
6.2 The role of the state	Supportive, enabling environment, legal framework
6.3 The role of donor agencies	Support, funding, impartial facilitator, training, capacity building

In the past policy has undermined and destroyed local level decision making. Hopefully changes in policy that entrench a sense of security of tenure and empower communities to take control of the management of their resources will emerge and be implemented. Current policy changes are very positive in this regard, though it is still unclear as to how implementation will take place on the ground.

Conclusions

Currently a vast number of institutions are engaged with rural communities. There is no cohesion in their approach and their involvement has many different goals and objectives. In many instances involvement is 'inflicted' on the community in a paternalistic fashion. Communities are being undermined in their ability to take true ownership of their resources and to develop sound local structures for sustainable resource management. A number of policy initiatives, and in particular the tenure reform process can greatly enhance local level resource management. For this to happen will however require resource management to be a top priority of the reform process and it is important that there is a sound partnership between departments responsible for resource management and the Department of Land Affairs in this regard.

International experience indicates that local level institutions that have a high degree of autonomy, clear sense of tenur rights to resources that are clearly defined and have in place locally regulate rules and regulations for sound resource use, can active sustainable group management of resources. A supporting environment that has appropriate policies in place is important.

Sound institutional structures are key to sound resource management. The role of extension staff should therefore be to assist in local institution building. Only once institutions are in place can management plans be developed. These should be developed locally, with the extension staff either facilitating the process or providing technical inputs when requested. These plans should incorporate indigenous knowledge alongside sound scientific understanding. The existence of the plan and the fact that it can be implemented is probably of far greater value than the actual technical details of the plan at this stage. The plan must however be flexible and be able to adapt rapidly if it is found to be ineffective. The management plan must include rules and regulations for resource use and spell out consequences of disregarding the rules. Policing of users, and

punishment for inappropriate uses should be internal issues governed internally by the community with support from external agencies. Only if rules are broken by people from outside the community should there be external involvement. State law enforcement should only be involved if disputes cannot be settled internally.

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CASE-STUDY OF COMMUNITY-MANAGEMENT FOR WOODFUEL SUPPLY PILOT PROJECT (LICUATI PILOT PROJECT) - MATUTUINE- MOZAMBIQUE

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Identification of the Case

The Licuati Pilot Project is located in Matutuine District, Maputo Province in the South region of Mozambique (Annex 1), and covers 70 000 ha. The project emphasizes forest management for woodfuels production, however it also deals with soil and water management related to agricultural development, towards a better sustainability of natural resources use. The important contextual factors in this case are:

- Political - A new political environment started in 1986, and the signing of the Peace Accord in 1992, and the democratic elections in October 1994 encouraged profound and rapid transformation from a centralized to a market economy, and to a more decentralized and participatory system of Government. The area selected for the project has a strong traditional power structure, which was associated with RENAMO during the civil war in Mozambique. Since the Mozambican Government is from FRELIMO, it was important for the project to link the traditional power structure and the Government bodies to facilitate the dialogue between them.

- Economic - The National Reconstruction Plan initiated in 1987 has as its the main objective the reduction of the food deficit situation by restoring the productive capacity of the rural sector. This region, due to the forest resources and its location near Maputo City, is the one of the suppliers of woodfuels (charcoal and firewood) for this urban center and can benefit economically from a from a carefully planned woodfuel production program. Furthermore, due to its location near to the National Elephant Reserve and to prime tourism locations, the Licuati community can also develop eco-tourism projects in their area.

- Social - The existence of a sacred forest in the area and the danger of its exploitation by outsiders strengthen the need for intervention in the region. Another important social characteristic of this community is the strong traditional power structure in place. Traditional natural resource management practices are communicated and implemented through this power structure.

Initial Situation

Community-based management of Forests in Mozambique was seen as isolated from other natural

resources as soil and water. Furthermore, previously the projects did not take into consideration such as the integrated nature of Forestry, Agriculture, Credit and Markets in community life. Projects only considered forest-related areas of intervention. Most of the staff involved were trained as foresters.

In relation to problems faced by rural communities in Mozambique, one of the major problems, due to the movement of people during the war, is the existence of outsiders to the communities ("ninjas"), who are not community members. The "ninjas" exploit the forests and do 'not follow the traditional rules concerning natural resources management. The communities are powerless in this respect, and their lack of knowledge in terms of laws and regulations, and the deficient links between the community's leaders and State Institutions do not help the situation.

Another characteristic of the communities in the South of Mozambique, is the lack of organized villages. Pãople live far away from each other, and rarely have economic activities that are carried out as a community. They get together to discuss their problems and possible solutions, but not to organize themselves to be more productive or to conquer a specific market.

The Change Process

The Licuati project identified the need to have an integrated approach, where the way of life of the communities was taken into account. The following objectives were defined for the project:

To achieve the objectives many activities were carried out, during last year.

- To establish a resource management and control system within the project area under the responsibility of local community;
- To promote appropriate technology in order to increase productivity and efficiency which could lead to a more adequate and sustainable use of resources;
- To facilitate communal links between producers and markets;
- To develop financial mechanisms including a credit scheme for the acqusition of

This project had a large number of community training activities (both in the field and through seminars). The project aims to develop skills in the pilot project.

To achieve the objectives many activities were carried out during the last year. This project had a large number of community training activities (both in the field and through seminars). The project aims to develop skills in the community. They include the use of improved technologies (for charcoal making, for brick making), and also involving community members in the control of their forest resources (48 members of the community were trained as community forest officers). The project nursery runs training courses for interested community members. The agriculture team is carrying out trial to introduce new cash crops in the area, and it is working with 32 families,

using local farming practices throughout the agricultural year, and discusses the findings, problems and possible solutions with the farmers.

On evaluation of the present situation, it can be said that important changes occurred during the implementation of the project, at community level:

- Associations of producers (charcoal, agriculture and forest nursery) are now being organized by community members, and there is a will to work with neighbors commercially;

- The training of 48 community members as community forest officers initiated a change in attitude towards outsiders and towards resource management in the area.

- The introduction of cash producing activities, such as brick making, production of sunflower seeds and seedlings created new income generating opportunities for the community.

- Local charcoal producers are now licensed by the Provincial Services of Forests and Wildlife, and the licenses were based on management plans;

- The development of improved charcoal kilns had a major impact on productivity. Carbonization time has been reduced from 7 days to 2 days.

Besides changes in the project area, some changes occurred at an institutional level and can be summarized as follows:

- The pilot project broke with the traditional coordination Setup for this type of project, in Mozambique. Due to the integrated nature of the project, instead of a project coordinator, the project has a coordination team, comprised of 3 members. The discussion among the coordinators helped to clarify and to balance the implementation of project activities.

- Also due to the integrated nature, the project staff comprised foresters, sociologists, chemical engineers, mechanic' engineers, agriculture engineers and economists. Every three months a one-day workshop took place. During the workshops the staff discusses the various activities together with the other teams and, the necessary adjustments were made. The multidisciplinary nature of the group clearly increased the speed of implementation and the rate of success of the activities. It also promoted multidisciplinary approaches to rural development and a new mentality on the part of project staff.

- The traditional knowledge on natural resources management found in the community was used during the project activities and it is now being discussed as to how to include this knowledge in the existing legislation.

Key Findings

After 10 months of implementation and working with the community members in Licuati, it can

be said that:

Rural communities have traditional rules for natural resources management, which can, if no external pressure is put on theses resources, conserve the available natural resources. These rules are usually transmitted by parents to children and are enforced through the traditional power structure in place. The disrupture of the traditional power structure and the break up of the social/family fabric due to the civil war allied with economic pressure changed the management practices used.

Community members are very sensitive to the effect of outsiders ("ninjas") using their natural resources without the community's permission. Furthermore, once they know the legal framework for natural resources use (forest legislation, land tenure law and so on) and have links with the State Enforcement system they are able to control the resources under their responsibility more effectively. The experience of this project has shown the importance of community forest officers and their working links with the State system.

The use of management plans in the logging of woodfuels is an important step towards sustainable use of forest resources. However, the sector legislation needs to be adequate. The activities in the project have shown that the present forest legislation is inadequate in the case of forest management for woodfuels production and stressed the need for an urgent revision of the regulation in use.

Forest resources are very important for the welfare of rural communities. The forest provides energy, construction material, medicines and also food and recreation. Forests are an integral part of the subsistence system in place but can also have an important role in cash producing activities. Charcoal production, eco-tourism and exploitation of precious woods are some of those activities.

Lessons Learned

Community-based projects always have a first stage of identification of opportunities, development of those opportunities and creatuion of new ones, followed .ãby a stage of consolidation. Due to the the short life span, the consolidation stage, which permits evaluation of the work done, adjustments and full production activities, is not yet completed. Therefore, it is important that the follow-up phase of this project, where the new opportunities will be developed and the working links consolidated, be implemented.

One of the main lessons learned was the need for a clear picture of the community, so that the project is part of and not something foreign to the community. The management of natural resources is very much linked to the cultural and social characteristics of the community. Therefore, it is also important to have a strong power structure in the community, so that information and implementation can reach every member of the community. The power structure can then be used as an effective vehicle to disseminate information and coordinate implementation.

The multidiciplinary approach is difficult to coordinate, and requires having clear objectives to be attained for the whole group. Good coordination between the different teams and an open-mind and willingness to learn and accept other ideas are also essential, in order to achieved good final results.

Nevertheless, it promotes rural development and allows a balance of different economic activities that lead to the improvement of living conditions in the region.

The experience of the Licuati Pilot Project can be applied to many of the communities in the country. The integrated approach in natural resources management used by Licuati community is not unique, and in most of rural Mozambique it is present in daily life. However, the strong traditional power structure and the social development found in Licuati is not widely spread in Mozambique, and most of the success achieved in this project was due to the commitment of the Licuati community, and their leaders. This situation will imply a change of approach in order to build the community power groups needed for the implementation. Another important factor was the level of commitment and understanding found in Maputo Provincial Forestry Services. The wilingness found in this State institution, although not unique, is rare. This implies the need to make the Forest Services prepared for this type of interaction with rural communities.

This experience can and should be used to define a broader program in the country, and the staff involved in the implementation can be valuable human resources for other projects like this one.

Acknowledgements

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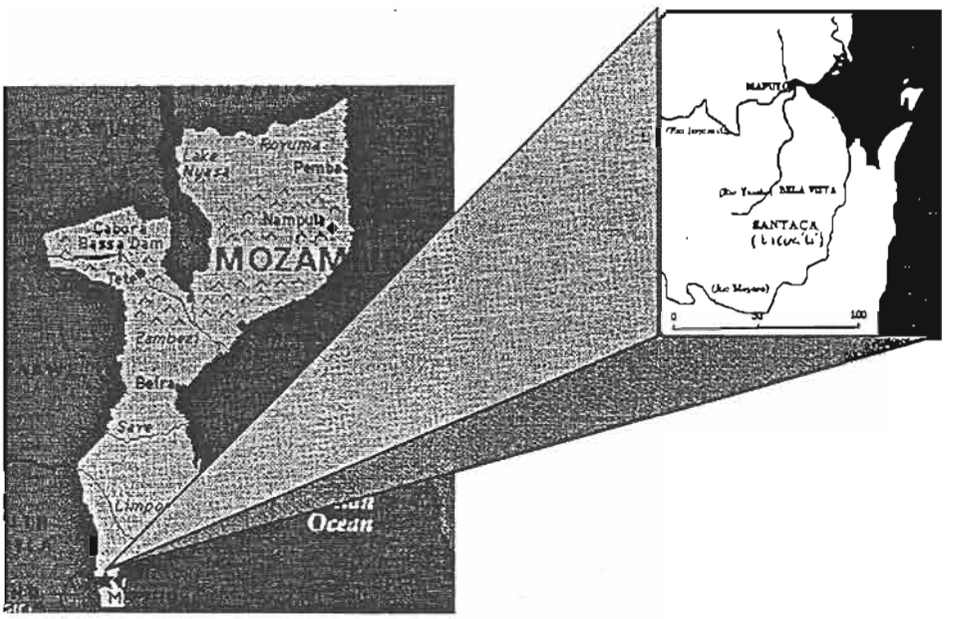
Progress reports from the Components

Technical reports of the project

ANNEX 1 – Project location



MANAGEMENT OF NATURAL FORESTS AT STATE FORESTS IN THE EASTERN CAPE FOREST REGION

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Introduction

The natural forests at State Forest land between Port Elizabeth in the South West and Kokstad in the North East have previously been administered by three different government organizations. Different policies and management approaches were applied, whereby certain forest areas enjoyed a high protection status, often without being fully utilised as a sustainable resource for the benefit of all concerned and affected people. Other areas however were indiscriminately over-utilized, often to such an extent, that a possible future sustainable utilization has become questionable. The establishment of a Forestry Conservation Sub-directorate for all forestry conservation matters on State Forest land in the Eastern Cape Forest Region, which excludes the Tsitsikamma forest for the time being, provides a unique opportunity to develop and apply a scientifically and politically acceptable conservation management system.

Even though the Forestry Conservation Sub-directorate of the Department of Water Affairs and Forestry (DWAF) has also been given the task to develop and co-ordinate conservation management systems for natural forests and woodlands outside the State Forest land, this aspect is not specifically addressed in this paper. The constitutional prescription that DWAF has to assist the provincial conservation body to take over the day-to-day management of forestry conservation matters is also not addressed.

The Goal

The policy of the government towards the management of the natural forests is defined in the National Forestry Action Programme (NFAP, 1997). The clearly defined goal is, that a strategy for sustainable management of natural forests has to be developed, tested and implemented. The road to successful implementation leads viathe "Joint Forest Management" (JFM) pilot projects for forests on State Forest land and via the "Community - Based Forest Management" (CBFM) pilot projects with regards to forests on communal land. The phrase "Sustainable Management" implies that optimal benefits have to be ensured, particularly for communities in close proximity to the forests, without infringing on environmental conservation principles.

This should be achieved by including all stakeholders in the decision making process, by applying lessons learnt from the JFM pilot projects and by developing forest resource accounting values.

Time limits are set to achieve the goal of the NFAP, i.e. to develop strategies, which will finally result in clear policies. A sensitive and consultative approach of all participants in this process, but particularly forestry staff of DWAF, is of utmost importance during this developing phase. Government officials' are used to precise and well defined policies and instructions, while the present phase of searching, learning and teaching is generally difficult to comprehend for them. Strong leadership and guidance will however enable the dedicated staff to achieve the goal for the benefit of the people and for the forests.

The Resource

The natural forests on State Forest land in the Eastern Cape Forest Region (excluding the Tsitsikamma natural forests) are mainly found in the Amatola mountain range, north of King Williams Town, along the Southern Drakensberg range from Umtata to Kokstad and along the coast from East London to Port Shepstone. Numerous natural forest pockets of varying sizes are also present at other State Forests, spread over a vast area. The total area of natural forests on State Forest land in the area under discussion is close to or slightly more than 100 000 hectare and exceeds as such the total natural forest area on State Forest land in the Western Cape, including the Tsitsikamma.

The Western Cape and Tsitsikamma natural forests can basically all be classified as Afro-montane forests, while a wide variety of ecologically different forest types have been identified by various authors in the Eastern Cape.

Acocks (1988) mentions the following veld-types:

1a : Typical Coast-belt Forest	1c : Transitional Coastal Forest
1d : Dune Forest	1e : Mangrove Forest
3 : Pondoland Coastal Plateau Sourveld Forest	5 : Ngongoni Veld Forest
44b : Dohne Sourveld Forest	

Cooper (1992) distinguishes two main forest types, i.e. Afro-Montane Forest and Indian Ocean Coastal Belt Forest with the following sub-types:

A	Afro-Montane Forest
1	Mist Belt Mixed Podocarpus Forest
B	Indian Ocean Coastal Belt Forest

1	Dune Forest	2	Swamp Forest
3	Pondoland Coast Forest	4	South Coast Forest
5	Coast Scarp Forest		

The most recent ecological vegetation type classification of Low and Rebelo (1996) Distinguishes between two vegetation types of the Forest Biome, i.e. 1. Coastal Forest and 2. Afromontane Forest.

This classification should be adopted for broad management purposes, while detailed ecological forest type classification will be adopted for conservation planning purposes, i.e. zoning of management classes, sustained utilization and monitoring.

It is of importance to note that the Eastern Cape Province contains 47,5% of all Afro-montane forests of South Africa, this includes the Tsitsikamma forests and 95,8% of all Coastal forests of South Africa (Low and Rebelo, 1996). This is a clear indication of the importance of responsible management of natural forests owned by the State in this Province.

The legal framework

The constitution of the Republic of South Africa, Act 108 of 1996 stipulates in its Bill of Rights, Section 24 "Everyone has the right... to have the environment protected, for the benefit of present and future generations, through reasonable legislation and other measures that.... promote conservation, and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development". This section provides the foundation for the management of the natural forests by emphasizing on the one hand the need for protection and on the other hand the sustainable use of natural forests for economic and social development.

The present Forest Act, still the legal basis of most operations undertaken by forestry staff, emphasizes the protectionist conservation policy, while referring only marginally to the social implications as addressed in the constitution.

This situation has lead to misunderstandings by forestry staff and communities adjoining natural forests on State Forest land. Forestry staff are still entitled and requested, in accordance with the Forest Act, to enforce law and order, which is not any more in keeping with the official political reality. Some communities and particularly evil minded individuals from communities far away from the resource, make misuse of the confusion and over-utilize the natural forests at a steadily increasing degree. Urgent political and legal clarification is needed in order to alleviate the tensions (mostly inherited from the political past) between communities and forestry staff for the benefit of the natural forests.

The new Forest Bill will bring clarification to the burning questions of rights of communities and duties of forestry staff.

The National Forestry Action programme (NFAP) is the only policy document, which serves at this stage as a guideline for management, even though it will only receive sufficient legal backing once the new Forest Act is promulgated.

The Planning Task

A competent conservation forestry planning section has to tackle the tremendous task to produce management plans and operational schedules. This requires the following activities:

- Broad ecological assessment, classification and mapping of all conservation areas on

State Forest land in the Eastern Cape.

- Zoning of all conservation areas on State Forest land in the Eastern Cape according to management classes and proposing the setting aside of nature reserves and other areas of ecological sensitivity and sites of rare and endangered species.

- Medium - and long term planning of all conservation activities on State Forests.

- Consideration of JFM and CBFM strategies and NFAP goals during all planing activities.

- Prepare short -, medium -, and long-term prescriptions for sustainable utilization of natural resources in order to ensure that the NFAP goals are achieved and the conservation principles of the IUCN are adhered to.

- Develop and manage suitable monitoring programmes for conservation areas at State Forests with adequate support from departmental scientists and other accredited or consultative research organisations. Particular attention has to be given to monitoring programmes to assess the impact of sustainable utilization of natural resources in accordance with JFM projects.

The Management Task

The Sub.-Directorate: Conservation Forestry has to be provided with an adequate infrastructure in order to attend to the tremendous task given.Conservation Forestry management centres have to be created and provided with adequately trained forestry staff, administrative personnel as well as control personnel (forest guards), supervisors (foremen) and general workers.

The conservation forestry management centres (forestry offices) and their coordinating division centres (district offices) have to be provided with adequate communication aides like telephones, radios and vehicles.

Practical management guidelines describing conservation forestry procedures to be handled at the sub.-division level (management centre) have to be compiled, tested and implemented. These guidelines and procedures will address aspects like consulting with communities, organizations(NGO's) and other governmental departments, administering sustainable utilization of forest products, procedures for control personnel (forest guards), control of alien vegetation, drafting of annual plan of operation, environmental education procedures and many more. Most of these guidelines and procedures are already available in one form or another. For practical application and easy acceptance, workshops will provide the ideal opportunity for conservation forestry training, which has to be attended to on a regular basis, because conservation forestry principles and practices are not generally known to the conservation forestry staff. The first training workshop was already held on 22 July 1998.

The control function of trained conservation forestry management staff is extremely important in order to avoid any misunderstanding, particularly in dealing with communities, NGO's and other

institutions. The creation of wrong perceptions could be detrimental to the successful implementation of JFM projects, which will be the foundation of future successful conservation forestry operations.

The Communication Task

Forestry personnel is usually well trained in professional aspects of forestry but has had little opportunity to develop social skills. In order to initiate, drive and implement JFM projects, good communication and social skills are a prerequisite and must be developed before JFM projects are entrusted to the relevant personnel.

Aspects which require the regular attention of conservation forestry staff will be:

- Identification of communities and their leaders: a great deal of diplomacy and tact has to be used to establish correct communication lines with communities, who may resent forestry staff, because of previous experiences, who are divided politically, who have other, more urgent, needs than to talk about conservation or who may have no structures with which to communicate at all.

- Identification of other role players: NGO's, other government departments, political figures or private individuals may have vested interests and could be of great support in developing JFM projects for the benefit of the forests and the communities.

- Develop communication skills: Once all interested parties have been identified and first contacts have been made the actual difficult task starts by communicating with the different parties separately and jointly. Each case will have to be handled differently and continuous attention has to be given to meaningful contacts in order to obtain consensus which has to be in line with conservation forestry principles.

- Needs assessment: It is generally known which services communities require from natural forests. These needs vary from place to place. Replacement opportunities may exist which will alleviate utilization pressure onto often over- utilized resources.

- Environmental awareness: Hand in hand with the development of meaningful communication lines and collection of information with regards to specific needs of communities general and specific environmental awareness programmes and environmental education should commence. Cooper (1992) suggests the use of a mobile education unit, discussions with education organizations to include environ-mental education programmes with regards to natural forests into their curricula as well as assistance from universities, colleges and NGO's.

The Structure

The development and implementation of a conservation forestry service, as envisaged by the Department of Water Affairs and Forestry, requires the establishment of a suitable structure. The top structure, consisting of the Sub.-Directorate: Conservation Forestry Eastern Cape, has already

been established in the office of the Director of Forestry at King Williams Town.

The conservation planning division under the guidance of an Assistant Director: Conservation Planning, on loan from the Knysna planning section, has started to function and operates under the direct supervision of the Deputy Director: Conservation Forestry.

Three management divisions (district office) will be created to plan, manage and control the functioning of the conservation forestry management centres (local conservation forestry offices). These offices will be established at:

- Umtata for the Matiwane Conservation Forestry Area,

- Kokstad for the East Griqualand Conservation Forestry Area and

- King Williams Town for the Kei Conservation Forestry Area.

A total of 13 sub.-division centres have to be created, which will serve as conservation forestry management centres with at least one, sometimes two, adequately trained conservation foresters each to attend to management tasks at natural forests and other conservation areas at 149 State Forests and community forest areas. The establishment of this structure is an important task. The creation of conservation forestry management centres, which will be directly responsible for all projects on State Forest land, advertising the posts, selecting and appointing suitable candidates and training and supervising the appointees will be the important task of the division heads. These positions have to be filled and their division offices have to function properly before the sub.-division centres can be created and start to function, because the top structure under the control of the Deputy Director: Conservation Forestry will have to concentrate its attention on implementation of Head Office policy, compilation of guidelines, budget, contact with other government departments and other institutions and professional administration of the sub.-Directorate.

Conclusion

To achieve the set goals of the National Forestry Action Programme (NFAP), conservation forestry activities in the Eastern Cape Forest Region have to focus on two main issues as far as the natural forests on State Forest land is concerned.

The one task is to assess the physical, ecological and managerial status of the forests in line with general conservation principles, while the other task is to create support and understanding from affected communities for sustainable utilization of the natural forests for the benefit of South Africa's present and future generations. The parameters and needs of these two different approaches may not always coincide and conflicting positions may arise where any kind of compromise may be of a disadvantage to the one side or the other. This must be avoided at all costs. The consensus approach must be that any programme, plan or project with regards to the natural forests of the Eastern Cape must be equally beneficial to the people and conservation principles.

This might sound difficult to achieve, but it is the ultimate task of all people involved in conservation forestry in the Eastern Cape Forest Region.

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WOODLAND MANAGEMENT: VENDA PERSPECTIVES

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OVERALL PROTECTION

TABOOS/BELIEFS

- Some tree species may not be brought home e.g. *Celtis africana*, *Artabotrys brachypetalus* and *Spirostachys africana*. *Celtis africana* and *Artabotrys brachypetalus* are used to protect the homestead (u vhea mudi)

- Trees struck by lightning can not be used as firewood

- Cane used for killing snake may not be used as firewood

- Trees without strong wood may not be used for fire and timber (*Erythrina lysistemon* and *Vernonia stipulacea*).

ENCOURAGEMENT OF TABOOS

- Leaders educate adults about taboos and beliefs in gatherings and adults educate their children.

- Adults inspect firewood to identify species collected

- Children collecting taboo species are reprimanded and carry them back.

CONTROLLED UTILISATION OF TREES

- Marula is brewed only during autumn - Leaders declare the season open, a ritual (the vhula) was carried out before brewing, compliance is enforced.

- Important trees may not be cut

  - Fruit trees (e.g. *Hexalobus monopetalus*, *Garcinia livingstonei*, *Ficus natalensis*, *Sclerocarya birrea*)

- Trees that conserve water (e.g. *Syzygium cordatum*, *Breonadia microcephala*, *Bridelia micrantha*, *Alsophila* spp)

- Trees that attract rain (e.g. *Ekebergia capensis*, *Ficus capensis*, *F. natalensis*, *Rauvolfia caffra*)

- Large trees that serve as wind breakers (e.g. *Parinari curatellifolia*, *Sclerocarya birrea*, *Salix subseratta*, *Syzygium cordatum*)

- Shade trees (e.g. *Ekebergia capensis* and *F. natalensis*)

- Trees that maintain the status of the territory (e.g. *Adansonia digitata*, *F. natalensis*, *Anthocleista grandiflora*)

- Trees associated with historical events (Muhuyu wa thomba)

SUSTAINABLE COLLECTION OF MEDICINE

- Only thin roots are cut from opposite sides
- Soil is replaced after collecting roots
- Part of the bark is cut from opposite site without ring barking
- The main stem is not cut
- Xylem is not cut when collecting bark

THREATS TO THE AVAILABILITY OF FOREST PRODUCTS

- Fuel wood - Reduction of natural vegetation size by pine and tea plantations, settlements, arable lands, over population, over collection and deforestation.
- Medicine - Too many traditional doctors, veld fires and uprooting of medicinal trees for selling.

PROPAGATION OF PLANTS

- Medicinal plants:

Euphorbia spp, *Bolusanthus speciosa*, *Synadenium cupulare*. *Asparagus* spp, *Antidesma*

venosum, *Tecomaria capensis*, *Carissa bispinosa*.

– Vegetables:

Urera tenax, Solanum nigrum, Curcubitaceae family (nngu and tshibavhi)

– Shade in graves:

Synadenium cupulare, Jatropha curcas, Adenia gummifera, Euphorbia tirucalli.

RITUALS RELATED TO COLLECTION OF MEDICINE

– Doctors should be naked in order to collect

– Stay away from a partner for seven days

- Pour snuff on the ground

– Yesterday's porridge is smeared on *Brackenridgea zanguebarica* roots

– *Brackenridgea zanguebarica* roots to be kept a night outside the yard

– Menstruating woman does not touch medicine

– Making of a grass crown before collection

– *Brackenridgea zanguebarica* is collected by people without children

– A tree is bought by silver coins

- Leaves are dusted before collecting

- Chicken or lamb should be slaughtered

CURRENT WOODLAND RESEARCH INITIATIVES IN THE KRUGER NATIONAL PARK REGION, AND HOW THEY FIT IN WITH KRUGER PARK OBJECTIVES

Harry C. Biggs, H. Eckhardt, N. Zambatis, A Potgieter, D. Pienaar and C. C. Grant.

South African National Parks Board, P. Bag X402, Skukuza 1350

The Kruger National Park (KNP) has recently redefined its mission in terms of three pillars: biodiversity maintenance, human benefits and wilderness. Under each of these, increasingly specific objectives emerge, leading down to explicit goals which often connote particular research projects. In addition, an overarching initiative to analyse a large base of historical data also targets meeting of current objectives. Interest is expressed in collaborating with other regional initiatives which overlap with our aims.

Extensive basic data sets underlie much of the existing and planned research. Aerial photo series (coarse-scale decadal, since mid-century, and fine scale on transects since 1980) and fixed-point photos at ground level are available. Veld condition assessment (herbaceous) at 500 points throughout the Park has been done since 1989, and a woody component is now being added. A 44-year old experimental burnplot programme (actually reflecting the fire-herbivory interaction) is still in operation, though being questioned now. A separate landscape-scale fire-system management trial, coupled to a management plan to allow high and low elephant impacts, is likely to start in 1999 and to generate macro-level research possibilities. Some exclosures have been present for decades, with more rigorous experimental ones being planned.

Riparian work is a prominent feature (thanks to the KNP Rivers Research Programme), with some work also available on ground and surface water effects on vegetation. A well-organised herbarium exists. Soil and nutrient monitoring are growing in importance. In addition, datasets on especially large fauna are available since 1980.

The objectives now specified in the revised management plan support considerable riparian work (much of this underway). The atmospheric objectives include an emergent interest in global climatic change. There are focussed alien vegetation objectives, supported by the increasing emphasis on integrated catchment management. The terrestrial programmes include plant, herbivory and fire studies and their interactions, especially as related to water distribution. Interest in modelling spatio-temporal change in vegetation is growing, this including pattern and process understanding. Autecological studies on key species are still lacking, this knowledge required for use in almost every other area.

Much of the research is driven by or directed towards servicing better understanding and calibration of the flux limits: the so-called Thresholds of Potential Concern (TPC's).

A major collaborative partner exists in the form of RFI-ARC who are in possesion of a decade of comparative data from the western boundary outside the KNP. It is hoped that this presentation will allow clearer understanding of some of the major KNP and related regional thrusts and stimulate

further collaboration. Do visit http://www.parks-sa.co.za (Scientific Services/M'mt plan).

SUSTAINABLE UTILISATION AND THE SOUTH AFRICAN NATIONAL PARKS: A POLICY UNDER REVIEW

(additional theme added to presentation at Woodlands Symposium at Louis Trichardt 13th August 1998)

Dr Harry C Biggs

South African National Parks Board, P. Bag X402, Skukuza 1350

The South African National Parks (SANP) is in the process of reviewing its policy with respect to sustainable utilisation, a process which should be completed by year-end. This policy review needs to be seen against the background of a functional but strongly transforming organisation which also has a new more representative Board, and is mounting drives towards public participation across many fronts. Due to the strong "people and woodlands" orientation of this meeting, it was felt essential to provide some tentative information in this regard at this forum

Sustainable utilisation has always been a contentious issue in National Parks, and consumptive utilisation in particular has till now been interpreted as being forbidden in Schedule I National Parks in South Africa. This has, however, always excluded the utilisation of any resource which became available as the result of management intervention aimed at ecosystem management per se (e.g. culling for ecological reasons). The policy currently under consideration provides for:

- Sufficient flexibility for all SA National Parks to adopt as a framework – and thus allowing for local customisation in conjunction with local communities (through what will be known as joint planning committees).
- Checking of likely impacts through EIA/scoping in each case, with follow-up monitoring.
- Submission of each case to the Board for consideration (so that the Board can set weigh up the national importance of the Park as opposed to local needs)
- Currently, according to the National Parks Act, harvesting of natural resources must be carried out by a SANP official.

Features of the Kruger Park (KNP) situation

- There exists some buy-in from adjoining communities as to benefits of non-consumptive utilisation i.e. they do not see consumptive utilisation simplistically (as the only issue likely to be to their long-term benefit) but also value ecotourism-related biodiversity opportunities. They realise that the Kruger Park cannot be "farmed" (i.e. for maximum offtake of game or other resources) and that even as such it would represent a finite resource with inbuilt operating costs.
- A joint planning committee will sit quarterly (and indeed there is almost daily contact at a more grassroots level through the Social Ecology Depts) to discuss matters of joint interest.
- There is extensive wilderness zonation (and a strong wilderness lobby, right up to Board level), delineating areas which may be visited by humans (under strict "minimum trace" conditions) but certainly not used for any form of utilisation. Outside these zones, potential standpoints

currently vary from a "buffer-zone" concept, preferably outside the national park, where harvesting may be allowed in a broader biosphere-type arrangement, to limited zone controlled utilisation in the Park.

Contacts: Central Policy: Dr Peter Novellie (petern@parks-sa.co.za or 012-3739770).
The following persons are all available in KNP at 013-7355611: Dr Stefanie Freitag (resource management); Ms Elisabeth Mhlongo (social ecology); and Ms. Jenny Botha (medicinal plants/traditional healers).

ESTIMATING SUSTAINABLE PRODUCTION OF FUELWOOD, LEAF FORAGE AND FRUITS FROM STRUCTURAL CHARACTERISTICS OF SAVANNAS

Dr Charlie Shackleton

Environmentek, CSIR, P.O. Box 395, Pretoria 0001

Introduction

- The national forest bill, and the national forestry action plan requires that:
    - DWAF must monitor and report on the state of south africa's forests and woodlands
    - The individual resouces, and the reosuce as whole be managed sustainably to the benefit and development of local communities, and the country
- There is little information on the state of woodlands throughout most of the country except at a cursory level
- Extraction rates, and sustainable yields of most woodland resouces are unknown, nationally, and regionally and locally
- Different scales require different approaches, but until there is a development of a good set of empirical studies, modeling or proxy values are the most efficient approach towards first guesstimates.

Sustainable Production of Deadwood

Approach:

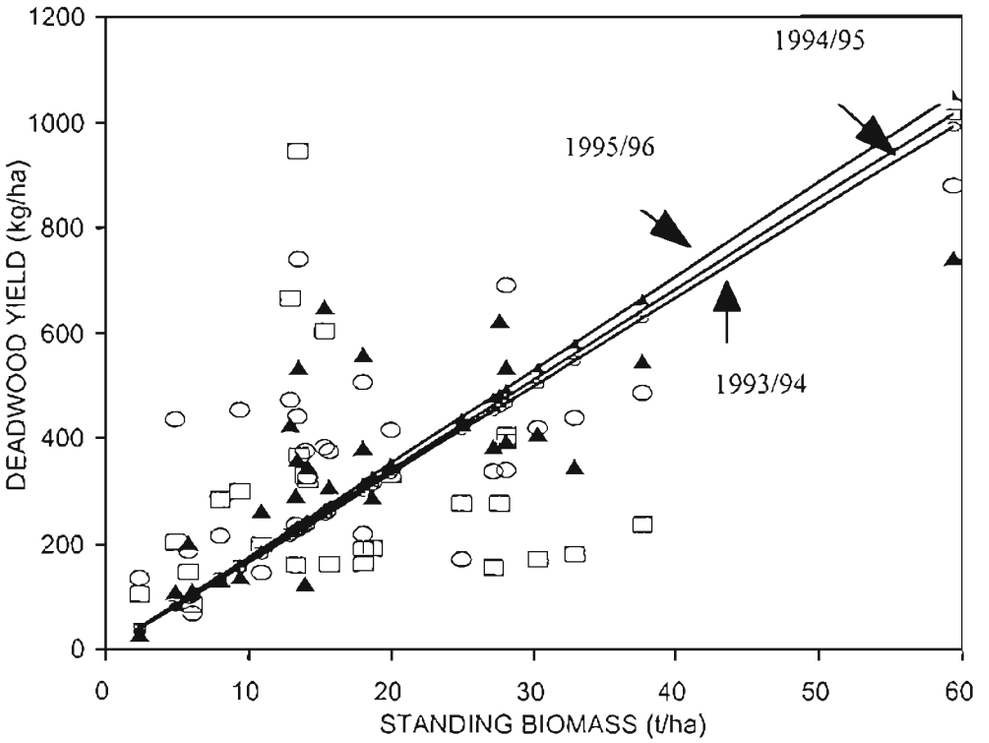
- 28 permanent plots (0.5 ha) for 3 years, at three localities along a rainfall gradient
- Harvested by hand all material on the ground, and that which could be broken off and carried away
- Therefore did not include any deadwood that was:
    - too small for fuelwood (< 5 cm circumference)
    - too big to carried
    - too high to reach
    - too hard to break off

Findings:

- Production per unit biomass was consistent between sites and between years despite varying rainfall (Table1) (Figure1).

Table 1. Annual harvestable dead wood yield from the arid, semi-arid and mesic localities

ATTRIBUTE		MESIC	SEMI-ARID	ARID
Mean Annual Rainfall		± 850 mm	670 mm	500 mm
No. of plots		9	10	9
Wodd harvesting history		Moderate	Negligible	Nil
Mean standing biomass of deadwood plots (t/ha ± SE)		25.3 (5.3)	14.4 (3.1)	17.7 (2.5)
Mass of dedwood at initial collection (kg/ha ± SE)		895.5 (116.7)	303.5 (61.2)	994.9 (139.3)
Deadwood production (kg/ha ± SE)	92/93	–	387.8 (85.5)	–
	93/94	438.0 (69.0)	270.4 (47.8)	380.3 (52.9)
	94/95	455.8 (62.3)	353.6 (55.4)	343.7 (63.2)
	95/96	211.7 (27.6)	259.8 (52.8)	590.1 (176.2)



Figue 1. Annual harvestable deadwood yield relative to stand biomass (▲ - 1993/94; ○ - 1994/95; □ - 1995/96)

- Summary relationships in the form:

*Annual production of harvestable deadwood (kg/ha) = k * Standing biomass (t/ha)*

Where k	(1993/94) = 16.7	(r^2 = 0.87; p<0.00001)
	(1994/95) = 17.1	(r^2 = 0.81; p<0.00001)
	(1995/96) = 17.7	(r^2 = 0.56; p<0.0001)

Production of Litter Fodder

Approach:

- 18 permanent plots for 2 years, at three localities along a rainfall gradient (9 sites on toplands & 9 on bottomlands)
- 50 litter traps per plot

- Litter harvested monthly and sorted into:
    - leaves
    - seeds & fruits
    - flowers
    - twigs
    - bark

Findings:

- Litter production was primarily related to stand basal area at a site, irrespective of position on the rainfall gradient:

$$\textit{1st yr annual litterfall } (g/m^2) = \textit{7.31(basal area)} \ (m^2/ha) + \textit{109.0}$$
$$(p<0.05;\ r^2 = 0.33;\ n=18)$$

$$\textit{2nd yr annual litterfall } (g/m^2) = \textit{3.75(basal area)} \ (m^2/ha) + \textit{120.6}$$
$$(p<0.05;\ r^2 = 0.29;\ n=16)$$

- Strong seasonal dynamics at all sites (Figure 2).

- Generally, topands had a marginally greater concentration of litterfall in a defined peak period than bottomlands (Table 2).

Table 2. Proportion (%) of annual litterfall during the four months with the highest input.

Rainfall zone	Catenal position	Proportion (%) of annual litterfall input during defined peak period	
		1993/94	1994/95
Arid	Top	79.9	69.8
	Bottom	66.5	63.2
Semi-arid	Top	76.7	75.8
	Bottom	67.8	77.9
Mesic	Top	77.5	74.0
	Bottom	73.0	72.2

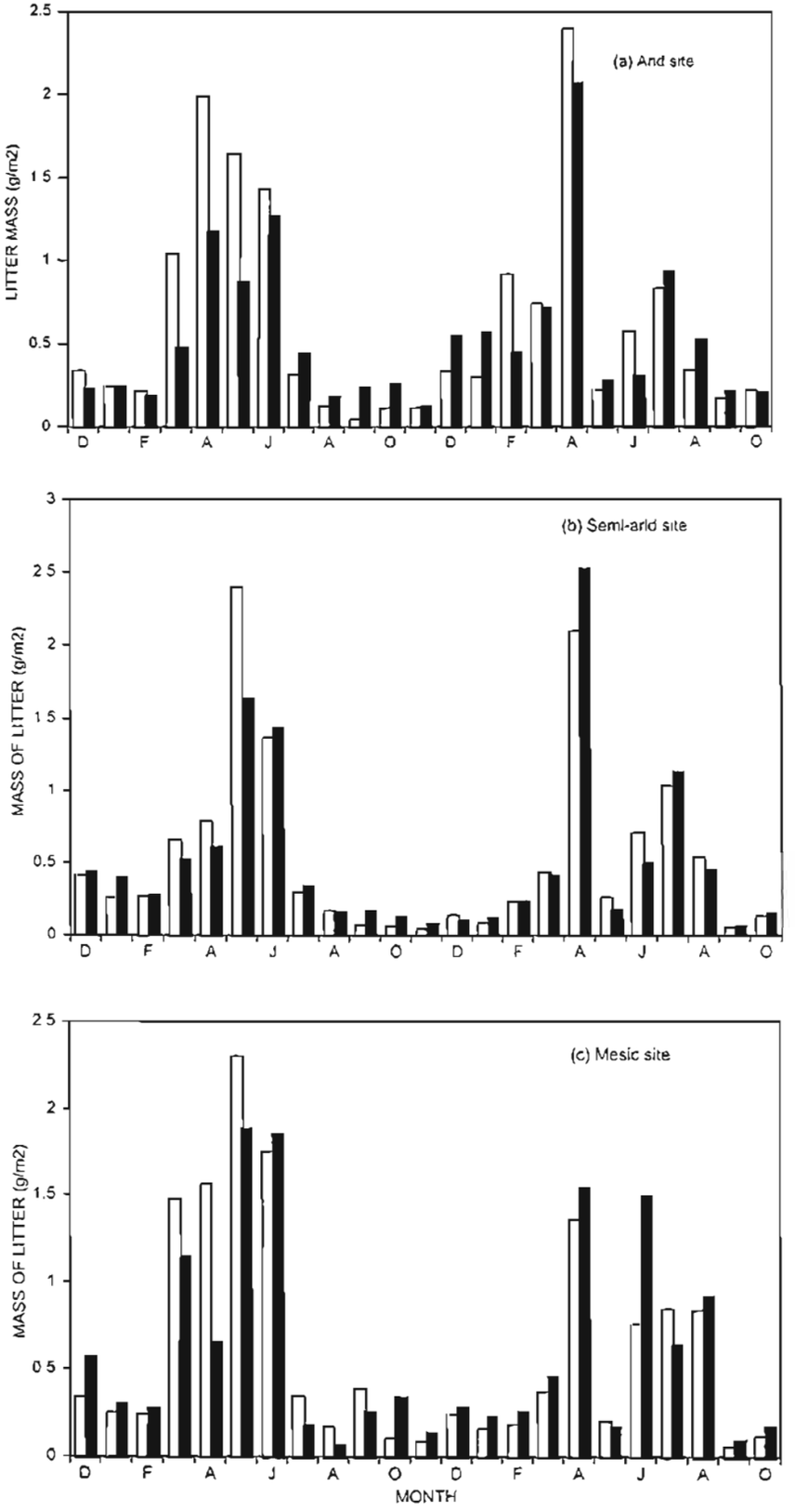


Figure 2. Litterfall at the arid, semi-arid and mesic localities (□ - toplands; ■ - bottomlands)

- Despite linear relationship with basal area, significantly higher litterfall per unit biomass at the semi-arid site than the arid and mesic sites (Figure 3).

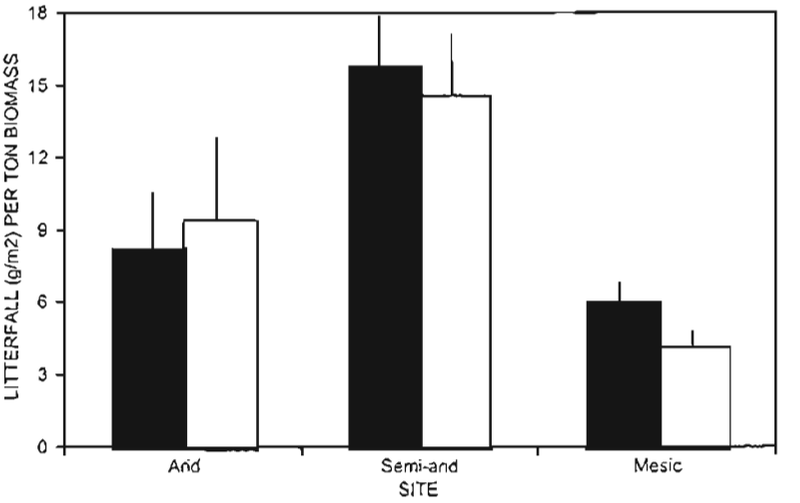


Figure 3. Litter yield per standing biomass (■ - 1st year; □ - 2 nd year)

- This corresponds with higher mean annual increment at intermediate rainfall registered from a number of sites throughout the biome (Figure 4).

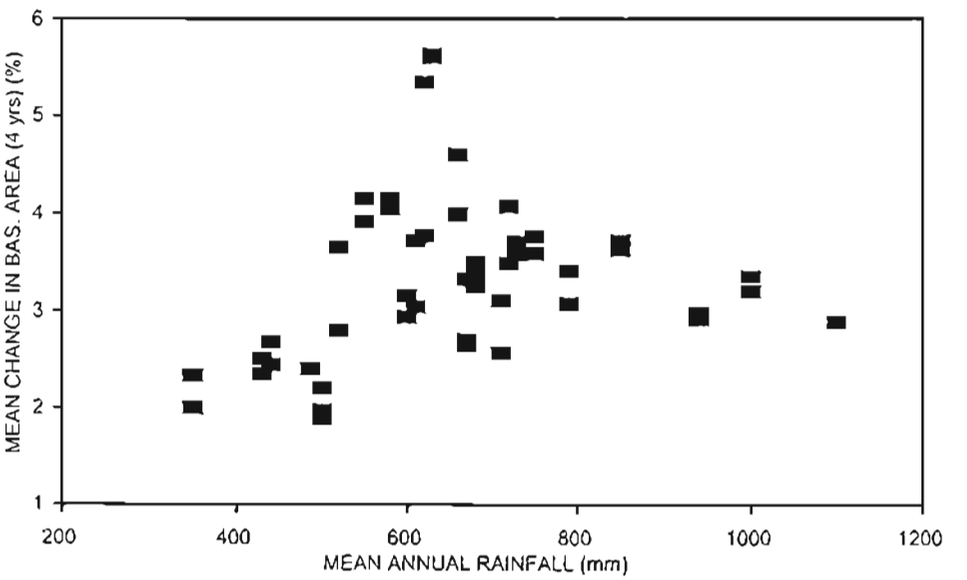


Figure 4. Mean relative change in basal area relative to mean annual rainfall (51 sites; mean of 4 years).

- Most of the litter was leaf litter (Table 3).

Table 3. Composition (% ± SE) of the litterfall

Rainfall zone	Slope position	Year	Leaves	Twigs	Bark	Flowers	Fruit
Arid	Top	1993/94	89.1 (1.23)	4.4 (0.27)	1.4 (0.38)	1.6 (0.23)	3.5 (2.0)
		1994/95	94.6 (1.94)	1.9 (0.54)	3.0 (1.64)	0	0.6 (0.6)
	Bottom	1993/94	84.7 (0.64)	5.2 (0.19)	1.1 (0.48)	4.2 (0.49)	4.9 (0.69)
		1994/95	89.6 (3.35)	4.7 (1.39)	0.6 (0.52)	0.4 (0.21)	4.7 (2.48)
Semi-arid	Top	1993/94	88.1 (2.31)	5.3 (0.73)	1.2 (0.4)	2.5 (0.7)	2.8 (0.77)
		1994/95	96.3 (0.78)	1.7 (0.42)	1.7 (1.21)	0	0.4 (0.22)
	Bottom	1993/94	87.9 (3.06)	6.7 (2.29)	0.9 (0.58)	2.4 (1.11)	2.1 (0.84)
		1994/95	95.7 (0.77)	2.3 (0.23)	0.7 (0.43)	0.3 (0.3)	1.0 (0.49)
Mesic	Top	1993/94	80.7 (4.64)	5.6 (0.95)	4.0 (1.57)	6.1 (2.91)	3.7 (1.22)
		1994/95	94.3 (1.22)	2.8 (1.70)	1.9 (0.15)	0.3 (0.3)	0.7 (0.56)
	Bottom	1993/94	83.9 (3.40)	6.1 (1.76)	1.9 (0.82)	4.9 (0.35)	3.2 (1.49)
		1994/95	96.4 (0.96)	3.1 (0.95)	0.4 (0.1)	0	0.1 (0.1)
Mean			90.1	4.2	1.6	1.9	2.3

Production of Fruit

Approach:

- Determined the proportion of stems in set size classes of the dominant species that had fruit
- Harvested and weighed fruit across a range of stem size classes
- Replicated across a rainfall gradient

Findings:

- Fruit production commenced at larger size classes with increasing aridity, both between sites, and between years at the same site
- For all species examined, there was a significant relationship between the mass of fruit produced and tree dimensions. This varied between species.
- Fruiting could commence when a stem was approximately 1/5 of its maximum potential size for that species
- All stems greater than 2/3 of the maximum potential size for that species would fruit.

AN ASSESSMENT OF THE HARVESTING OF BARK FOR MEDICINAL PURPOSES FROM THE WOODLANDS OF SOUTHERN MAPUTALAND

Mr Wayne Twine

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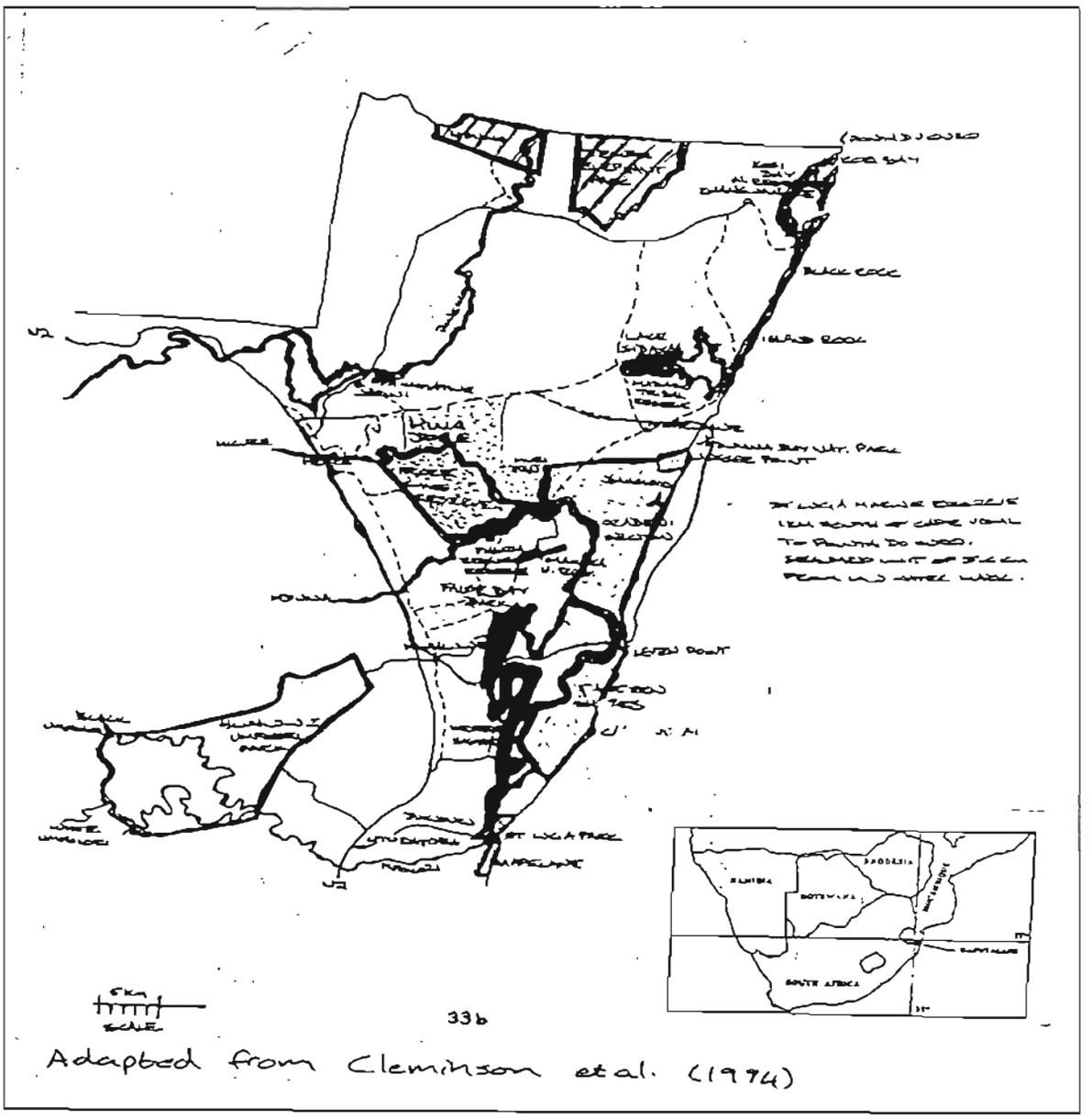
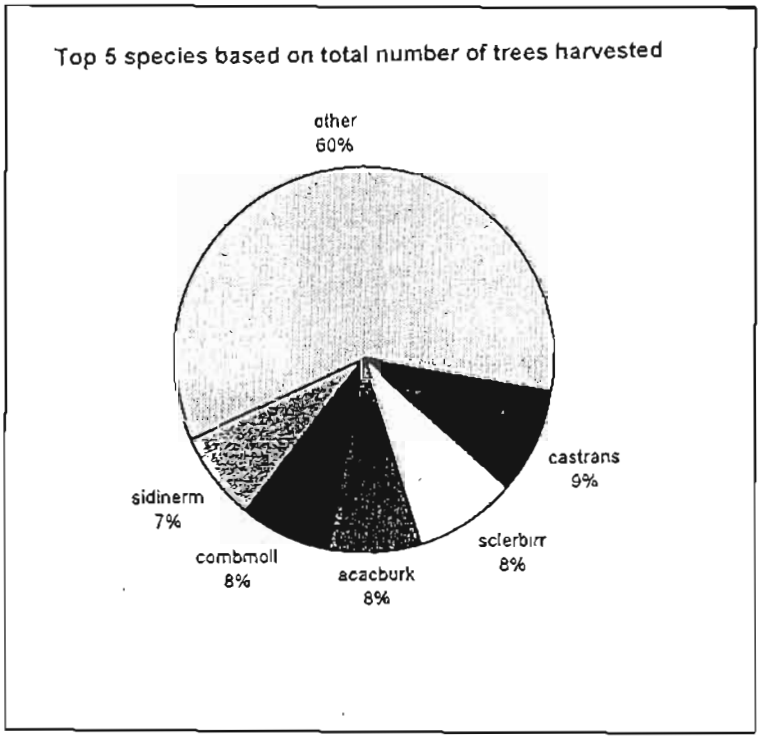
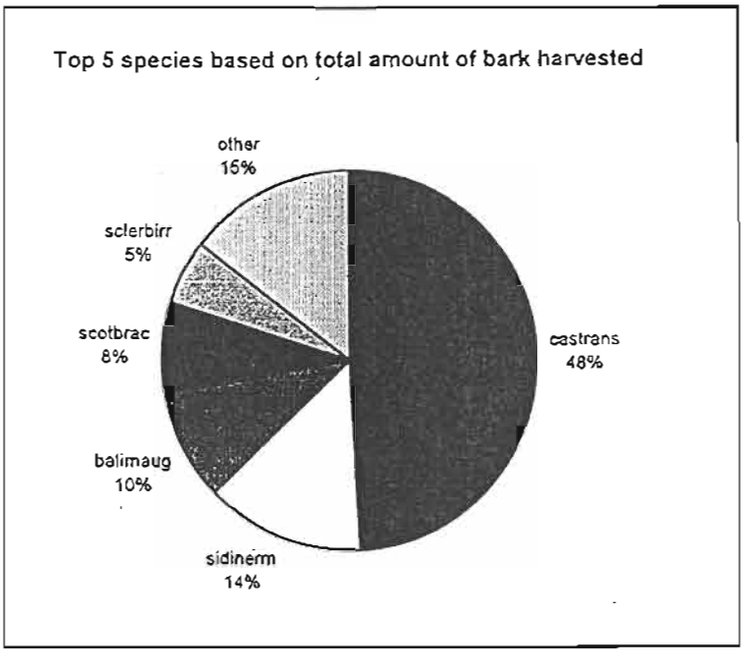
STUDY AREA

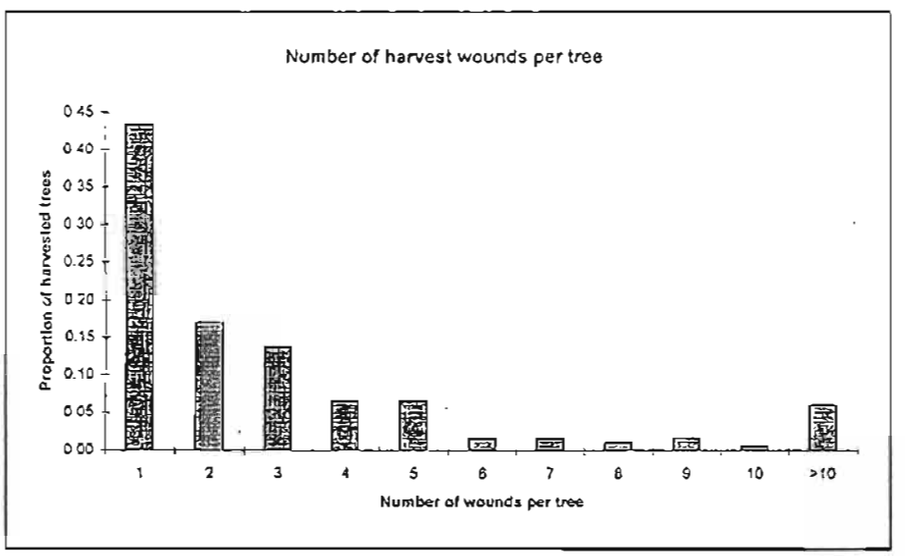


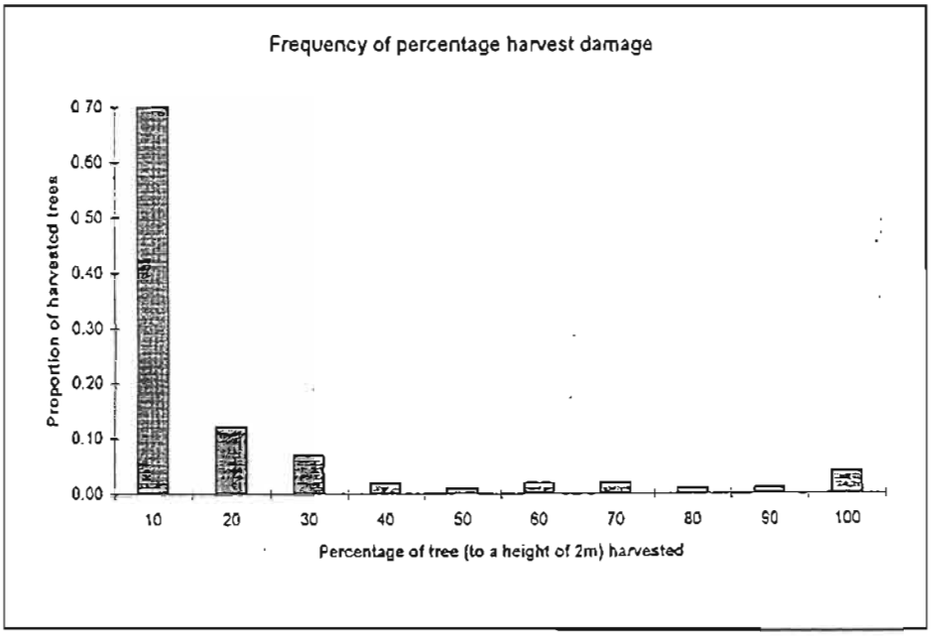
RESULTS

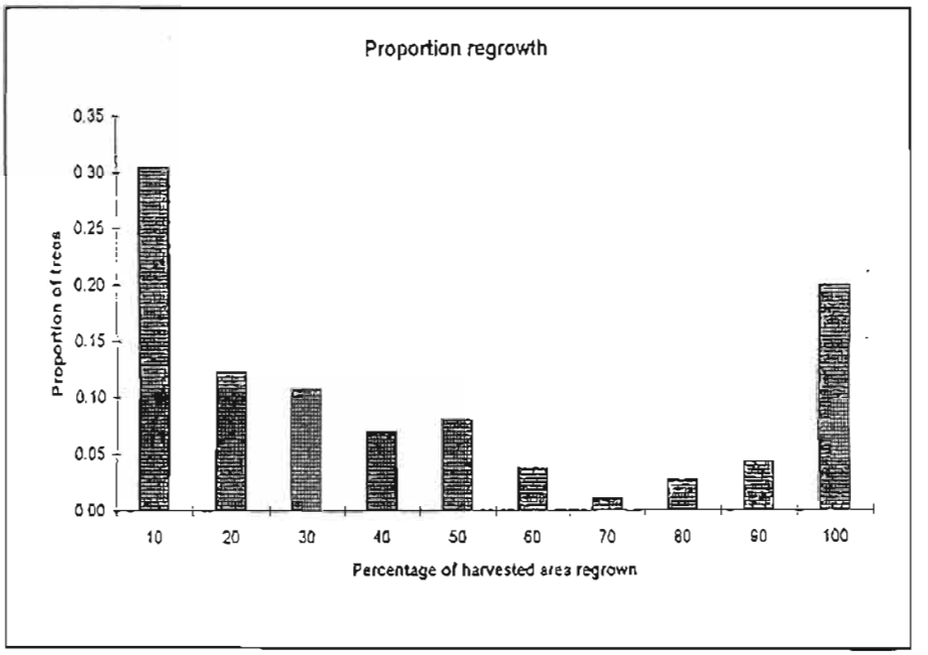
- 36 Species
- Top 5 species based on:
    - total number, and
    - total area of bark harvested
- 14 trees / hectare harvested
- 12% of trees >2 m
- 5 m^2 / hectare harvested

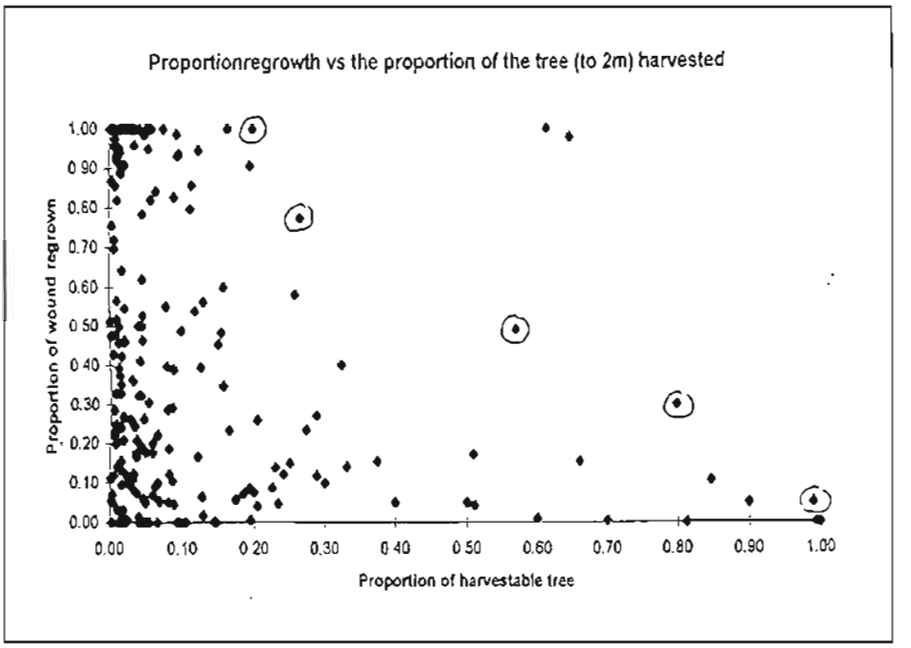


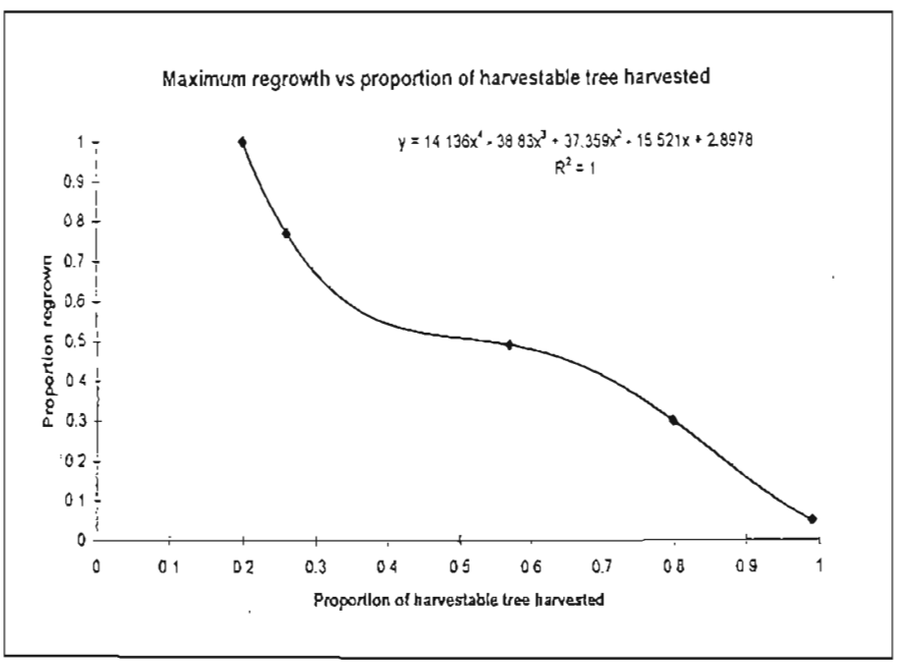

Top 5 species based on total amount of bark harvested
other
15%
sclerbirr
5%
scotbrac
8%
balimaug
10%
sidinerm
14%
castrans
48%

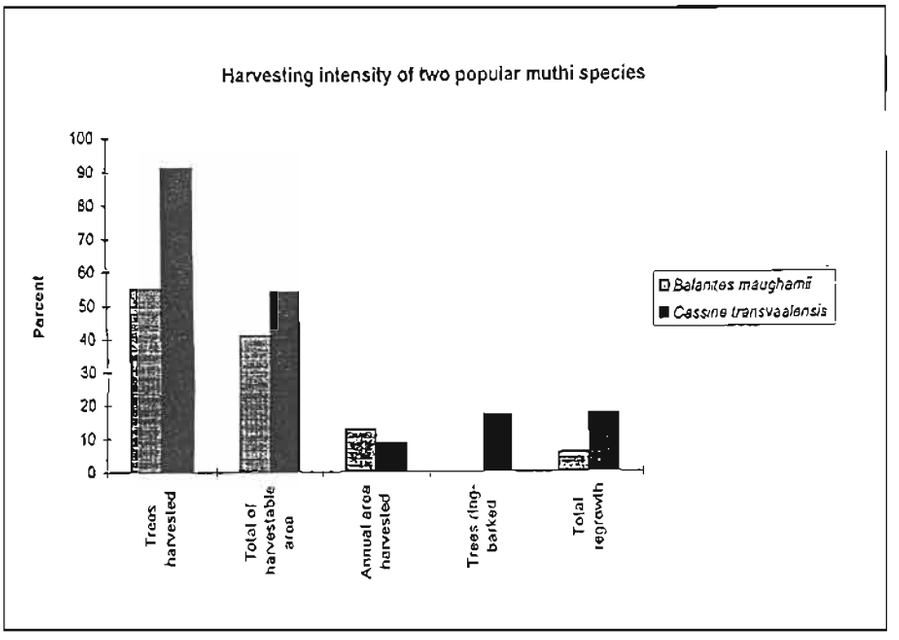

Number of harvest wounds per tree
Proportion of harvested trees
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1
2
3
4
5
6
7
8
9
10
>10
Number of wounds per tree

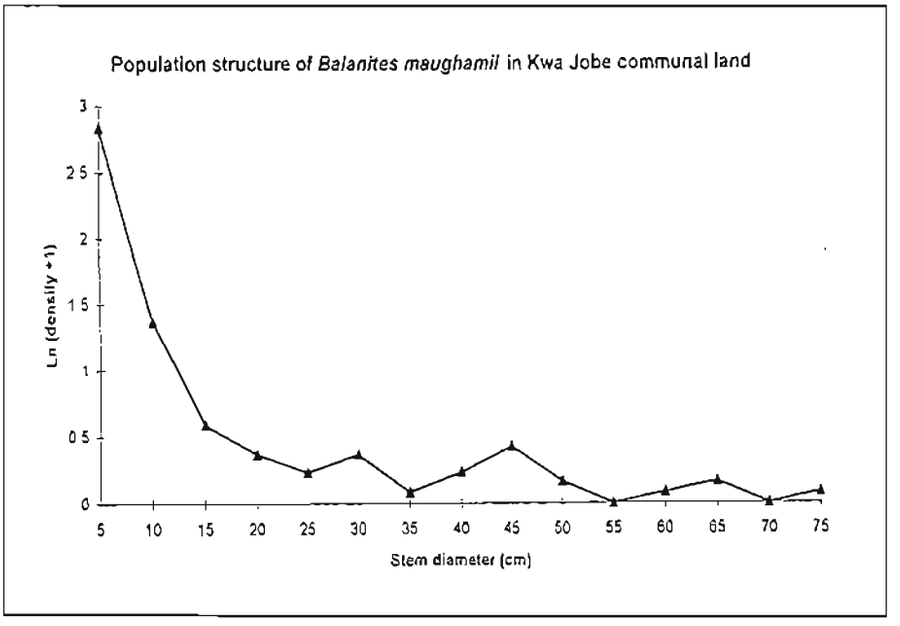

Frequency of percentage harvest damage
Proportion of harvested trees
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10
20
30
40
50
60
70
80
90
100
Percentage of tree (to a height of 2m) harvested

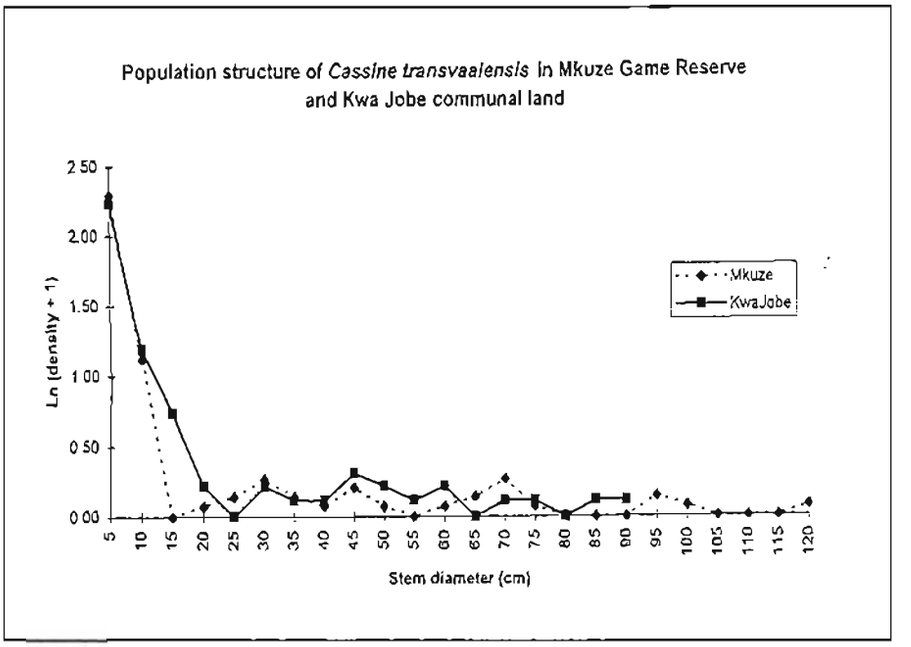

Proportion regrowth
Proportion of trees
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
10
20
30
40
50
60
70
80
90
100
Percentage of harvested area regrown

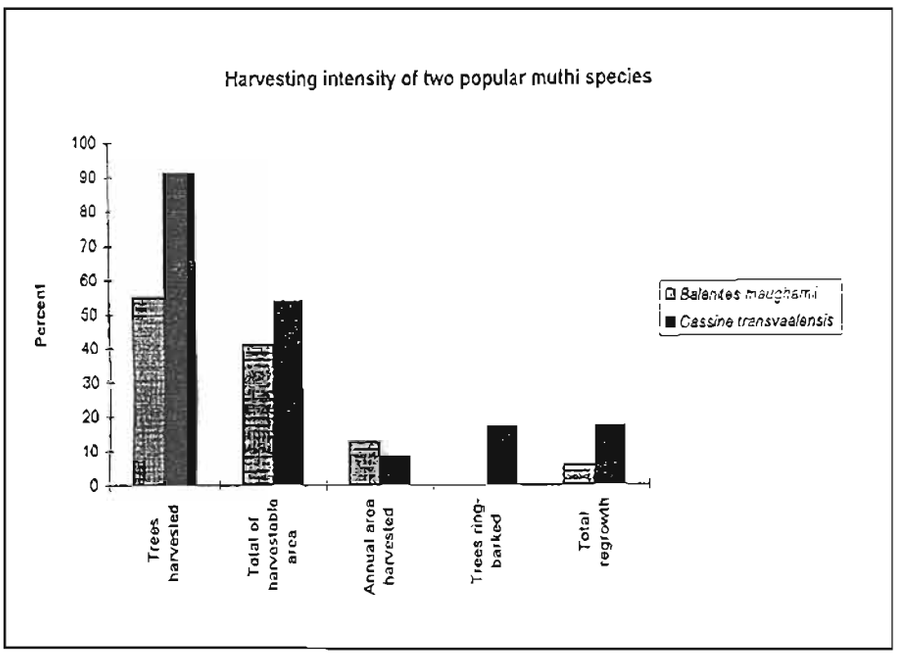

Proportionregrowth vs the proportion of the tree (to 2m) harvested
Proportion of wound regrown
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
Proportion of harvestable tree


Maximum regrowth vs proportion of harvestable tree harvested
y = 14.136x⁴ - 38.83x³ + 37.359x² - 15.521x + 2.8978
R² = 1
Proportion regrown
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Proportion of harvestable tree harvested


Harvesting intensity of two popular muthi species
Percent
100
90
80
70
60
50
40
30
20
10
0
Trees harvested
Total of harvestable area
Annual area harvested
Trees ring-barked
Total regrowth
Balanites maughamii
Cassine transvaalensis


Population structure of Balanites maughamii in Kwa Jobe communal land
Ln (density +1)
3
2.5
2
1.5
1
0.5
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Stem diameter (cm)


Population structure of *Cassine transvaalensis* in Mkuze Game Reserve and Kwa Jobe communal land
Ln (density + 1)
2.50
2.00
1.50
1.00
0.50
0.00
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120
Stem diameter (cm)
Mkuze
KwaJobe


Harvesting intensity of two popular muthi species
Percent
100
90
80
70
60
50
40
30
20
10
0
Trees harvested
Total of harvestable area
Annual area harvested
Trees ring-barked
Total regrowth
Balanites maughamii
Cassine transvaalensis

DISCUSSION

- Important resource
- Wide range of species
- Relatively small proportion harvested intensively
- Apparently unsustainable for some species
- Research needs:
  - annual bark regrowth rates
  - factors influencing regrowth and coppicing rates
  - tree recruitment in savannas
  - integrated management

IMPROVED PRODUCTION OF INDIGENOUS FRUIT TREES, PREFERRED BY COMMUNITIES, THROUGH DOMESTICATION AND CULTIVATION

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Introduction

Indigenous tree species have been used by local communities for food, medicine and building material for centuries. In some cases this utilisation has become so extensive that these species are threatened by extinction. A huge source of local knowledge has developed around these species and their uses.

This indigenous knowledge base must be seen as *"an enormous and under- utilised national resource"* (Chambers, 1983) that can be utilised to the benefit of rural people. In the development of industries based on forest products, knowledge of the local people can play a vital role. The Faculty of Forestry at the University of Stellenbosch is involved in a project researching the possible domestication of some of the indigenous fruit trees in South Africa. This project is part of the Community Forestry University Research Network of the Department of Water Affairs and Forestry.

The overall goal of this project is to establish small-scale industries in the rural areas that are based on domesticated indigenous fruit trees. An example of industries that can be established around the fruit of indigenous trees is for instance the making of jam, juice and oil to be sold to the growing eco-tourism industry.

This project will endeavour to provide communities with domesticated, improved and easier to cultivate indigenous fruit trees. The species researched are those that were identified by communities as being important to them. Continual selection and tree breeding will be used for the domestication and cultivation process. Tree breeding is a long-term project and therefore it is expected that the project will run for at least five years.

Rationale

The domestication of indigenous trees is not a new concept. Domesticated fruit trees like apples, pears and plums were all growing "wild" in their native areas before someone saw the opportunity of domesticating these fruit trees.

Looking at the history of the apple, it is believed to have been derived from southwest Asia, where the mix of native *Malus* species could have given fruit of a size and quality attractive to man. There

are records in both early Greek and Roman literature of apples, and it must be assumed that there was some recognition of distinct varieties of superior quality as there are also references to propagation by grafting (Bultitude, 1983). Variety lists of apples were already available as early as 100 B.C. (Smock and Neubert, 1950).

Natural forests and woodlands make an important contribution to household food security in many districts by providing more benefits to households of lower economic status, alternative sources of food and essential dietary supplements (NFAP, 1997). Indigenous forests can, however, provide much more than just this basic needs.

Amarula Liqueur, a brand name of Distillers Corporation, is an example of an indigenous tree product that is earning South Africa large amounts of foreign exchange. Amarula has a 55% market share in the domestic cream liqueur market and exports accrued to double the domestic sales of **Amarula. Amarula** is exported to 50 countries around the world (Riedel, *personal communication).* Marula products such as beer, jams and jellies have also gained recognition.

Another example is that of an unemployed man from a squatter settlement outside East London who earned R 2000 in 1996 from jam made from *Harpephylum caffrum* fruits that he collected in a forest close by (Fenn, *personal communication).*

Through the domestication of indigenous fruit trees a range of products can be produced that will help to alleviate poverty in rural areas. These domesticated trees, if distributed to rural communities can also take the pressure of the indigenous forests.

Objectives

The project has the following objectives:

- Identification of indigenous fruit trees preferred by communities through community surveys.
- Selection of indigenous tree species for domestication and a genetic variation survey
- Comprehensive literature study
- Nursery and cultivation study
- Establishment of orchards, experimental plots in co-operation with communities
- Dissemination of information through articles and workshops

Activities

Activities related to this project include the following:

- Orientation study (March - July 1997)
  Survey in selected communities to tap local knowledge on the utilisation of indigenous tree species
  Detailed literature survey
- Genetic variation survey in distribution range of selected tree species (August - December 1997)

- Laboratory analysis of collected plant material to establish genetic variation (January- July 1998)
- Investigation into cultivation techniques (March - December 1998)
- Tree breeding (January 1999- March 2002)
- Establishment of orchards, experimental plots
- Evaluation of products

Orientation Study

One way of tapping into the indigenous knowledge base is by way of social surveys. Such a survey was, undertaken in the former Transkei. The villages covered were: Tombo (31°38'S; 29°23'E), Mtambalala (31°32'S; ,29°35'E), Lower Mtambalala (31°28'S; 29°33'E), and Cwebe area (32°15'S; 28°53'E). A follow-up survey was conducted in KwaZulu-Natal. The villages covered were: Pietermaritzburg, area (29°33'S; 30°19'E), Dukuduku (28°22'S; 32°24'E) and Draai-om (27°26'S; 31°25'E).

For the surveys a non-scheduled interview method was followed. This entails the formulation of a list of precise questions prior to the interviewing (Swanepoel, 1995) but the interviewer is free to formulate the questions as judged appropriate for the given situation. Respondents were not confronted with already stated definitions or possible answers, but were free to express their particular views (Bless and Higson-Smith, 1995; Karmann and Lorbach, 1996; Dold and Cocks, 1997). No time limit was fixed for completing an interview. An interpreter was used to observe the true meaning of words and sentences. With this type of interview it was possible to establish a 'shopping list' of popular tree species as well as tree uses. All ages and gender groupings were covered to obtain a representative sample (Van Eck *et al.,* 1997; Tengnäs, 1993).

Botanical specimens were collected during informal transect walks with people from the communities in the indigenous forests close to the interviewed communities. These walks often attracted a crowd of children and other interested followers who willingly shared their knowledge of forest products.

These walks were a very important component of this project. By walking through the forests with people who know them, products identified in the community surveys can be pin pointed. Samples were then gathered for botanical identification of the selected species. Information was also obtained as to the biological characteristics and growth requirements of the identified species.

During the interviewing all the tree names obtained were in Xhosa and Zulu. It was possible to convert these Xhosa 'and Zulu names to botanical names with the help of relevant publications (Bhat *et al.,* 1990; Dold and Cocks, 1997; Dold, Unpubl.; Fox and Norwood Young,1988; Palgrave, 1996; Pooley, 1994; Hutchings, 1996; Van Wyk and Van Wyk, 1997; Peter, Unpub.) and by identification of samples taken in the forests. The popularity of a tree species was judged by the number of times a tree species was mentioned during the interviews. This was arranged according to villages and tree usage (Van Eck e! *al.,* 1997). The information collected was not subjected to quantitative analysis because of variability in the types and number of people interviewed in each village (Karmann and Laboch, 1996).

Information obtained

It was found that the young children, especially the young boys, have a very good knowledge of forest trees. This correlates with findings that primary school children are the major collectors of wild fruits (Champbell, 1989 ex Packham, 1993). They collect the fruit for leisure and for them fruit trees are rather sources of delicacies than sources of food. The older people use the forest trees more for firewood and building material than for the collection of fruit.

The investigation has shown that the people in the survey utilise a great range of forest trees. Ten species were identified that can be classified as multi-purpose *(Englerophytum natalense, Ficus sur, Grewia lasiocarpa, Vangueria infausta, Ficus natalensis, Uvaria caffra, Dalbergia armata, Cussonia spicata, Dovyalis caffra and Celtis africana).* All of them can be used for their fruit as well as their timber properties.

Species selected for domestication

Englerophytum natalense (Natal milkplum) was the most popular fruit tree species. According to the people interviewed, this can be attributed to the fruit of the Natal milkplum being sweet and the trees being smaller than other fruiting species like *Harpephyllum caffrum* (wild plum). This tree in the family *Sapotacea* is family of *Englerophytum magalismontanum* (Stem-fruit), which is also a popular indigenous fruit tree.

Genetic variation study between provenances

Various sampling points in the distribution area of *Englerophytum natalense* (Figure 1) were identified by examining collection points of herbarium specimens of the National Botanical Institute in Pretoria. The following provenance were chosen: Malalotja Nature Reserve (31°25'E; 27°49'S), Ngome State Forest (31°25'E; 27°49'S), Hluhluwe Nature Reserve (32°3'E; 28°3'S), Mapelane Nature Reserve (32°25'E; 28°24'S), Eshowe (31°28'E; 28°54'S), Twinstreams (31°44'E; 28°59'S), Umdoni Park (30°41'E; 30°23'S), Oribi Gorge Nature Reserve (30°16'E, 30°44'S), Mtumvuna Nature Reserve (30°10'E; 31°2'S), Ferncliff Nature Reserve (30°20'E; 29°33'S), Kranzkloof Nature Reserve (30°50'E; 29°46'S), Mtambalala (29°37'E; 31°32'S), Tombo village (29°22'E; 31°38'S), Cwebe Nature Reserve (28°54'E; 32°14'S).

Figure 1: Distribution range of E. natalense

Material collected

Leaf and branch material were collected from each provenance, measured (length and width) and preserved together with twigs in FAA fixative. This will be used for anatomical studies. Where present, buds and flowers were collected and als0 preserved in FAA. Pollen will be studied for taxonomic patterns. Fruit, when present, was collected for electrophoresis and germination studies. The length and width of the seed and fruit were measured. After germination, the roots will be used for chromosome counting. Herbarium specimens were also collected at every provenance to look for variance.

Soil as well as forest litter samples were collected for analysis by the Soil Science Department of the University of Stellenbosch. This data will help to set up a profile of the growth requirements of the species. Geographical Positioning System (GPS) readings of latitude and longitude were taken. This will be used to compile climatic data with the help of Geographical Information System (GIS) data.

Analysis of information obtained

From an analysis of the soil samples it was clear that *E. natalense* grows in poor acidic clay soils with a leaching status of non-saline to weakly saline. The climate in the distribution area tends towards a subtropical climate with warm summers (20 - 25 °C), mild cool winters (15 - 17.3 °C), summer rainfall (750 - 1000 mm) and a high humidity.

Seeds and leaves are being used for SDS-Page protein electrophoresis to determine if there are any differences in the protein make-up of the different provenances, as well as within provenances. This is complemented with anatomical studies of the leaf and branch material. Pollen, leaf areas and gynoeciums are also studied with a scanning electron microscope and the roots of seedlings from the different provenances are used for chromosome counting.

A taxonomical tree, that will indicate the most suitable provenance for tree breeding, will be

compiled after analysis of all the data.

Cultivation of *Englerophytum Natalense*

The cultivation of selected tree species is a very important component of a tree domestication programme. It is necessary to collect parent material from different provenances of a species to establish a genetic base from which genetic selection and tree breeding work can be undertaken. The best way of establishing such a genetic bank at one location is to cultivate the plants from cuffing material that was collected from the parent plants at the different provenance locations. It is also very' important to investigate the different cultivation techniques for a selected species and to select the easiest way of propagation. The ease with which a species can be propagated will play an important role in the establishment of industries based .on such a species.

Propagation techniques tested for *E. natalense*

The following techniques of propagation were tested for *E. natalense:*
- Seeds,
- Cuttings.

Seeds

Fruits of *E. natalense* were collected in September/October 1997 from the following locations: Mapelane Nature Reserve (32°25'E; 28°24'S), Eshowe (31°28'E; 28°54'S), Umdoni Park (30°41'E; 30°23'S), Oribi Gorge Nature Reserve (30°16'E, 30°44'S), Mtumvuna Nature Reserve (30°10'E; 31°2'S) and Mtambalala (29°37'E; 31°32'S). The seeds were removed from the fruit and germinated under controlled conditions. Germination percentages 40 days after germination ranged from 20% to 55%. Seedling survival rates were assessed seven months after germination and ranged from 0% to 89%.

Cuttings

Vegetative, or asexual, propagation is used to produce a plant identical in genotype with the source (mother) plant. This process is possible because living cells contain genetic information in their nuclei necessary to reproduce the entire plant (Hartmann et al., 1990).

During March 1998 cutting material was collected from eight provenances of *Englerophytum natalense.* These provenances were: Ferncliff Nature Reserve (30°20'E; 29°33'S), Kranskloof Nature Reserve (30°50'E; 29°46'S), Umdoni Park (30°41'E; 30°23'S), Oribi Gorge Nature Reserve (30°16'E; 30°44'S), Mtamvuna Nature Reserve (30°10'E; 31°2'S), Port St Johns area (29°37'E; 31°32'S), Tombo village (29°22'E; 31°38'S) and Cwebe Nature Reserve (28°54'E; 32°14'S).

Different cutting types collected

It was decided to collect hardwood and softwood cuttings from *E. natalense.* The softwood cuttings were prepared from the soft, succulent growth of the 1997/98 season. The hardwood cuttings were

prepared from the more hardy second year growth on the tree. They were all treated with rooting hormones.

Transportation of cuttings

Transportation of cutting material has always been a problem, as the time period between the collection of plant material and the planting of the cuttings must be kept to a minimum. Considering the geographical distance between Stellenbosch and the provenance sites, it can be extremely difficult to get fresh material to Stellenbosch in a short enough time span to ensure adequate survival. As part of the experiment it was decided to use three different methods of transportation. All three of the different transport methods were applied to hardwood and softwood cuttings.

Different transportation methods:

- *In situ* planting of the cuttings
  One of the methods was to prepare the cuttings at the site of collection, treat them with rooting hormones and to plant them in a mixture of composted pine bark and vermiculite in Unigro containers. The Unigro trays were covered with a transparent plastic canopy to prevent excessive evaporation and the cuttings were watered with a fine mist spray every two to four hours during the day.

- Transport of cuttings in cooler boxes with growing medium. Cooler boxes were half filled with thoroughly moistened growing medium. The cuttings were planted in the growing medium, frozen ice bricks placed in the boxes and then closed. The objective of this method was to keep the cuttings cool, moist and dark in order to slow down the metabolic processes and to prevent the cuttings from drying out.

- Transport of cuttings in cooler boxes without growing medium Cuttings were also transported in cooler boxes but without growing medium. The cuttings were placed inside wet brown paper bags and then placed in the coolbox with ice bricks.

Treatment of cuttings at the Faculty of Forestry nursery

The cuttings that were transported in the cooler boxes were placed, after being planted in Unigro containers, on heated beds. Four Unigro trays with cuttings that were *in situ* planted were also placed on the heated beds, while two trays of this type of cuttings were placed on beds without any heating. The cuttings on the heated beds received bottom heating of between 25 and 28 °C. The cuttings were irrigated by means of a continues loop mist spray system that sprayed them every 15 minutes for 3 seconds. This system prevents the cuttings from desiccating and kept the air temperature below 35 °C.

Survival rate of the cuttings at the Faculty of Forestry Nursery

The cuttings that are still alive four months after preparation were counted. Some of the cuttings started to form new leaves and roots. The survival percentages for the different transport methods, types of cuttings and nursery treatments ranged from 3% to 23%. The softwood cuttings were doing better than the hardwood cuttings on average but a statistical analysis of the data needs to be done to establish whether or not these different survival rates are significantly different and to look at interactions between treatments, provenance locations and transport time.

Future Research

The Faculty of Forestry aims at extending the range of indigenous fruit trees that are being researched. Research is currently concentrated on the Eastern Cape and KwaZulu-Natal but through the selection of species like *Vangueria infausta* can this be extended to the Northern and North Western provinces. Collaboration with research institutions like Veld Products Research in Botswana will make it easier to work in these areas.

The domestication of indigenous fruit trees will be a long process but the first step in achieving this goal is to realise the huge potential locked up in Southern Africa's indigenous flora.

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ESTIMATING THE STATUS OF WOODLAND RESOURCES IN SOUTH AFRICA

(Poster)

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The forthcoming completion of the CSIR /ARC National Land-Cover Database (NLC) project and the availability of the recently completed NBI Vegetation Map allow, for the first time, a broad-level assessment of the current status of the woodland resources in South Africa to be undertaken.

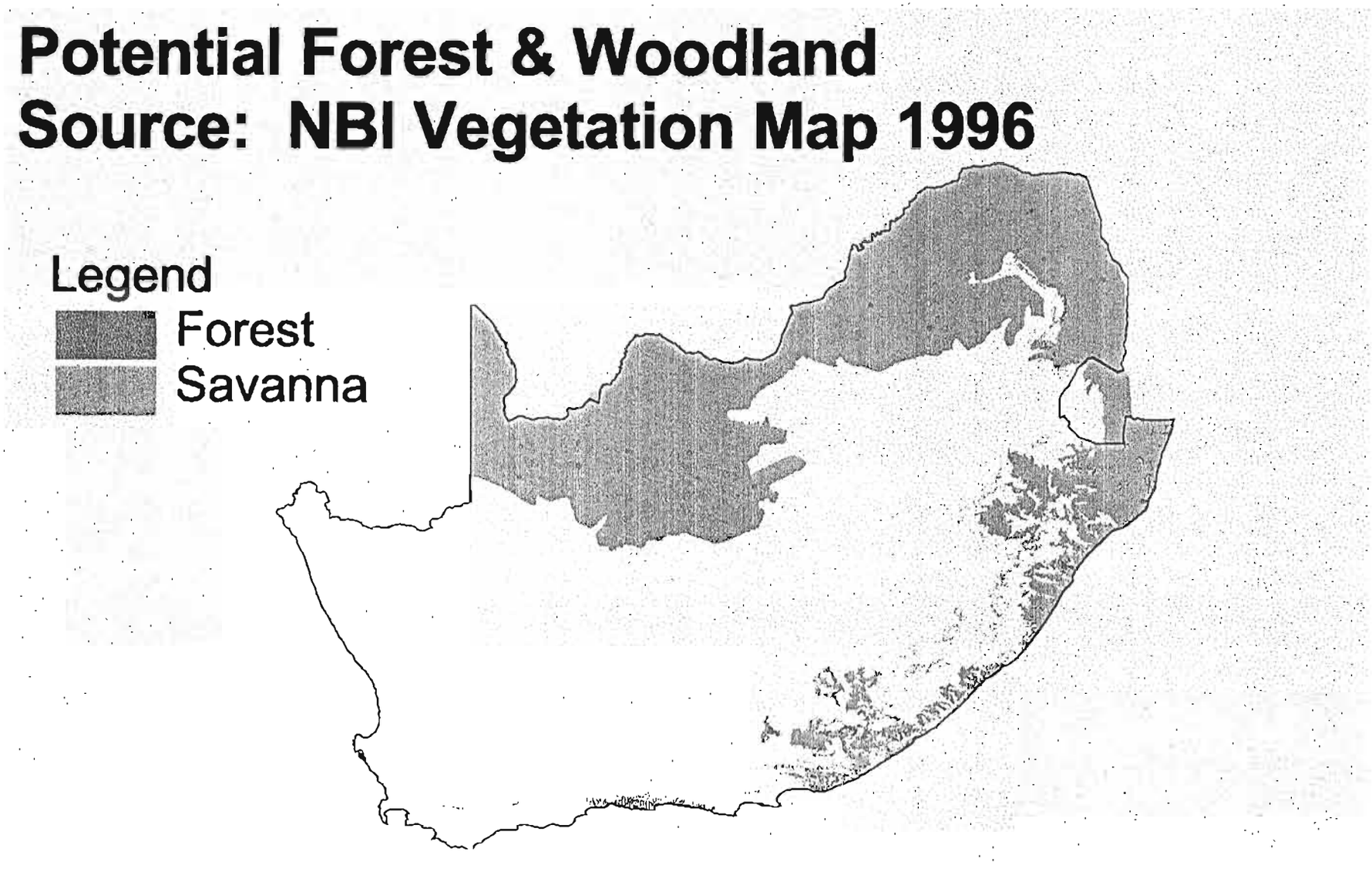
The map opposite illustrates, in broad terms, the impact of current land-use on the woodland resources in South Africa. It has been derived by overlaying the current land-cover data on the potential vegetation data in order to identify all areas of remaining natural vegetation (i.e .untransformed) and those areas that have been lost to various land-use (i.e. partially transformed and totally transformed).

In order to simplify this preliminary assessment, the NBI vegetation classes have been re-grouped into 3 basic classes, namely 'forest', 'woodland', and 'other'. The 'untransformed' forest and woodland areas are defined as those areas equating to those mapped as 'natural' vegetation classes within the NLC dataset.. The 'partially transformed' areas are those vegetation areas equating with 'degraded' areas within the NLC dataset, and the 'totally transformed' areas are those equating with the urban, cultivated and afforested areas in the NLC dataset.

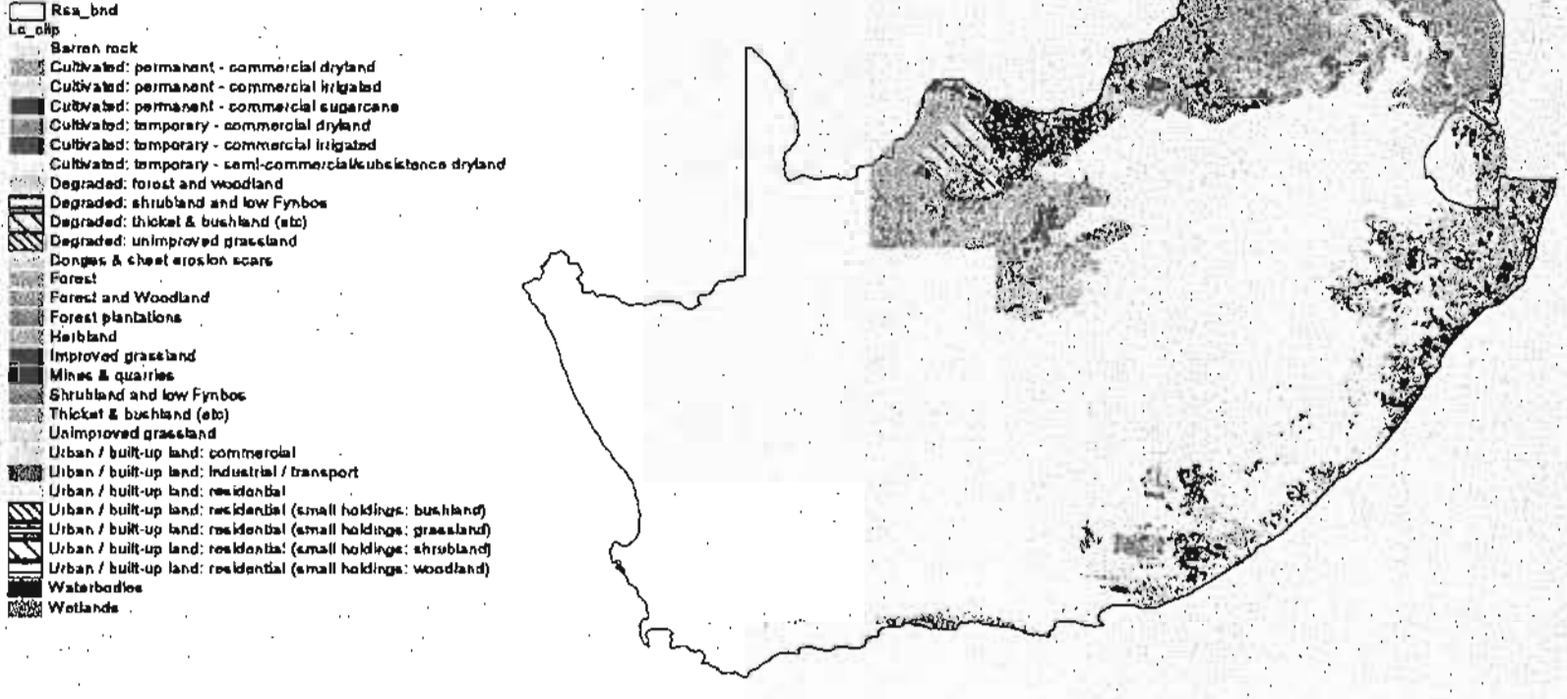
Preliminary results, (which are intended as discussion stimulants only) indicate that o f the potential forest and woodland areas, comprising ± 733,000 ha forest and ± 42,643,000 ha woodland, only ± 38 % of forest areas remain (± 281,000 ha), and ± 48 % of woodland areas remain (± 20, 295,000 ha).

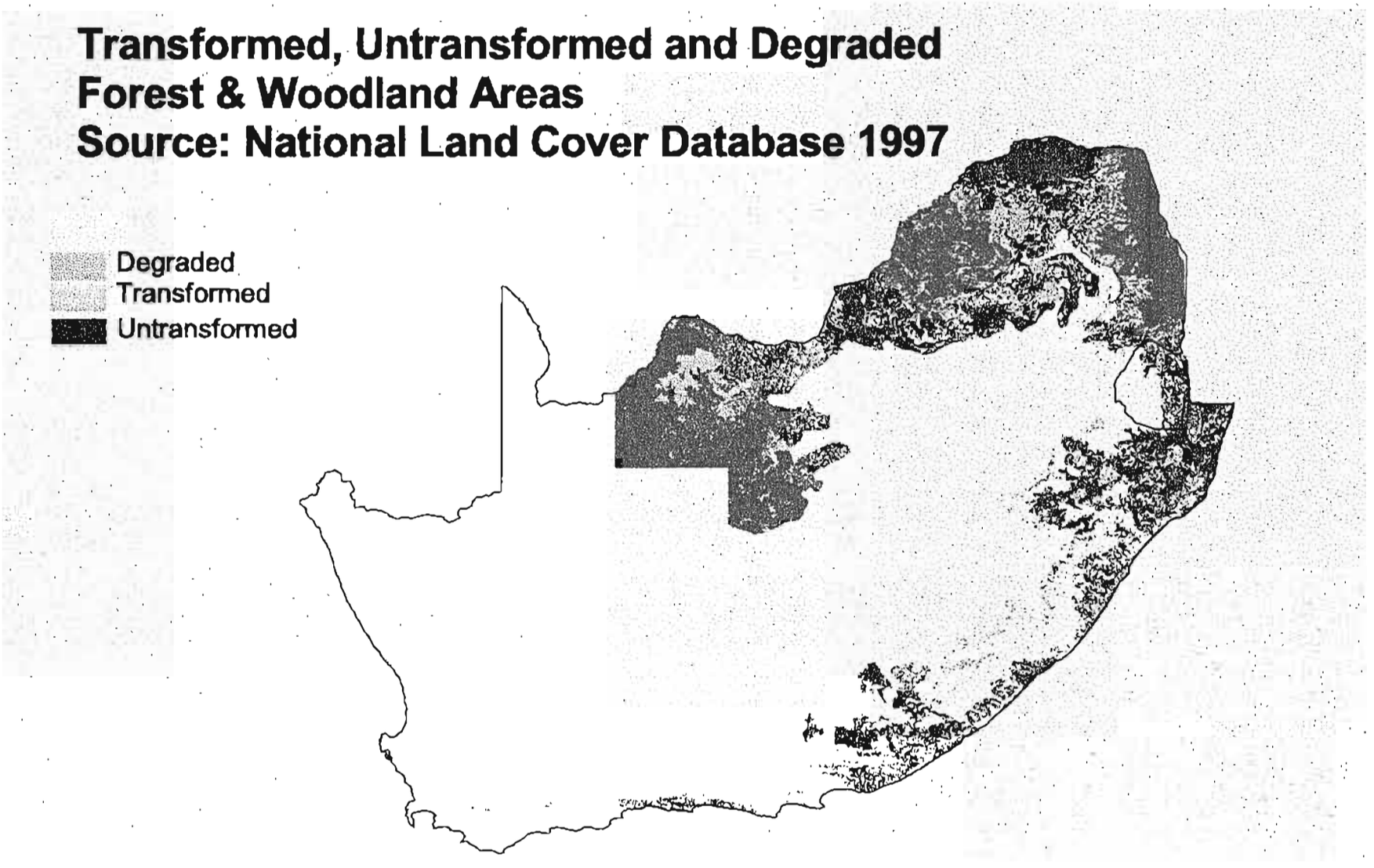
Approximately 52 % (or ± 22,799,000 ha) of the potential forest and woodland areas as defined by the NBI Vegetation Map have been lost or partially transformed according to the current land-use as mapped in the NLC dataset.

Potential Forest & Woodland
Source: NBI Vegetation Map 1996

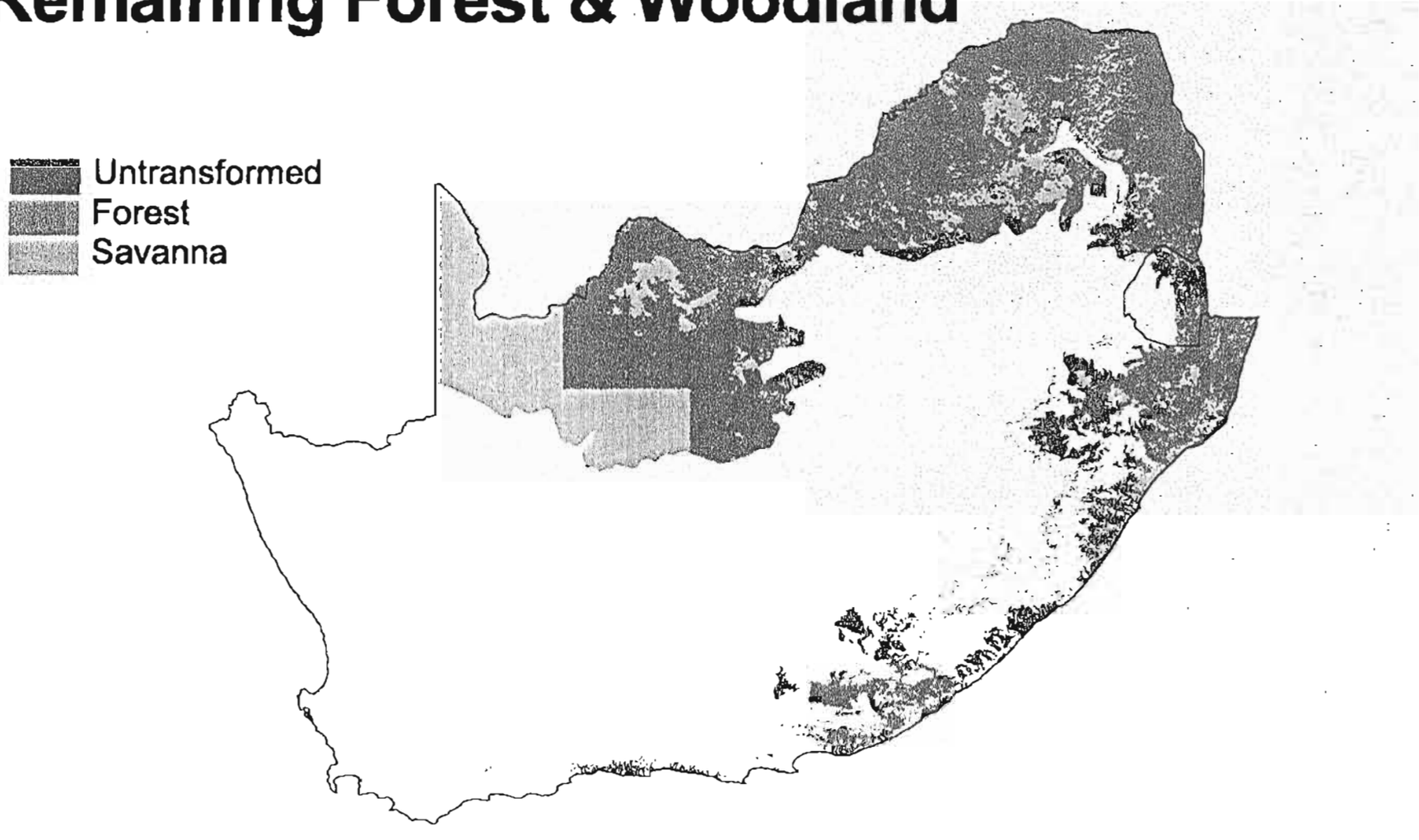


Current Land Cover/ Land Use
Source: National Land Cover Database 199




Transformed, Untransformed and Degraded
Forest & Woodland Areas
Source: National Land Cover Database 1997
Degraded
Transformed
Untransformed

Remaining Forest & Woodland



CRITERIA AND INDICATORS FOR ENVIRONMENTALLY SUSTIANBLE DEVELOPMENT OF TERRESTRIAL ECOSYSTEMS

(Poster)

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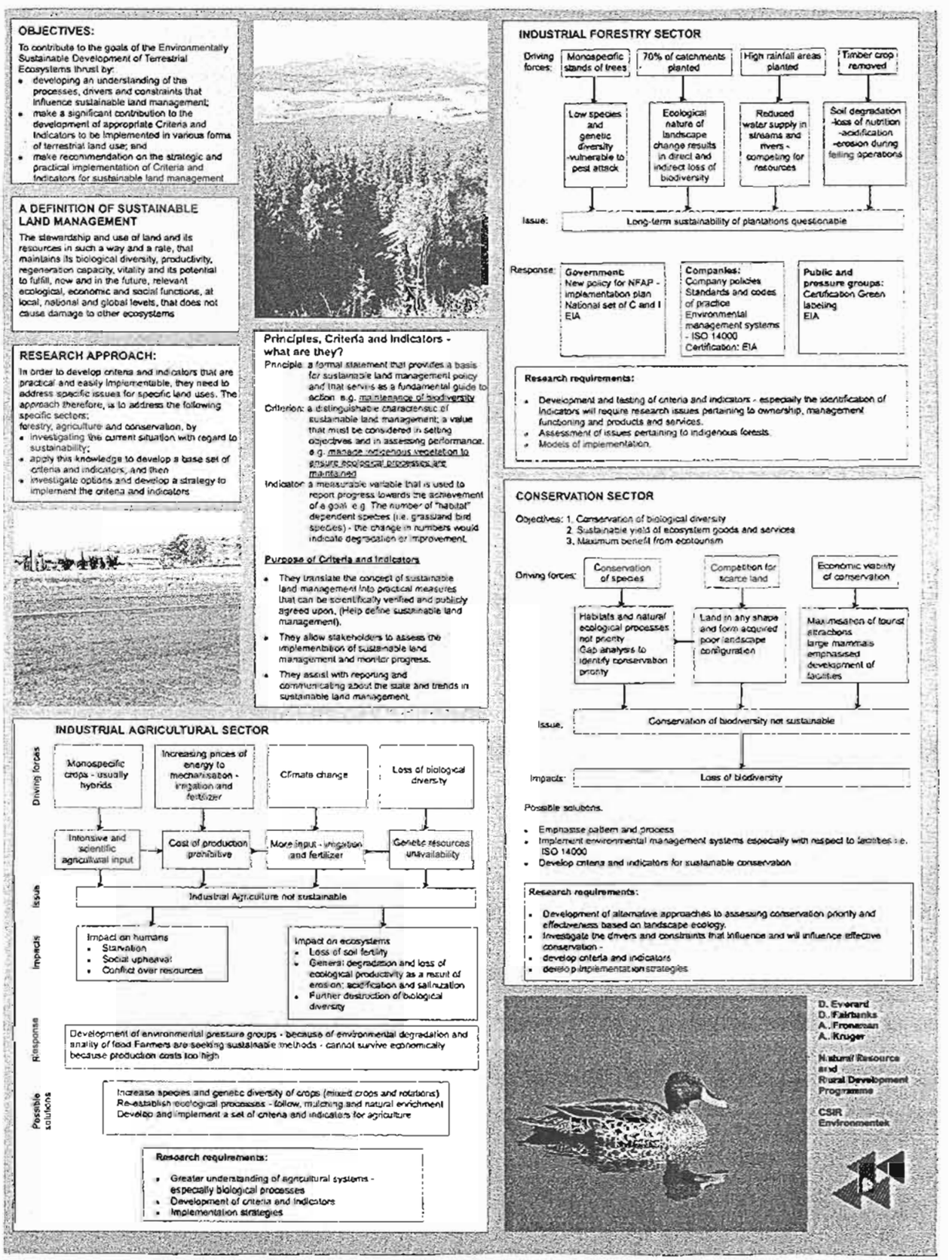

HOW MUCH ARE OUR WOODLANDS WORTH?

(Poster)

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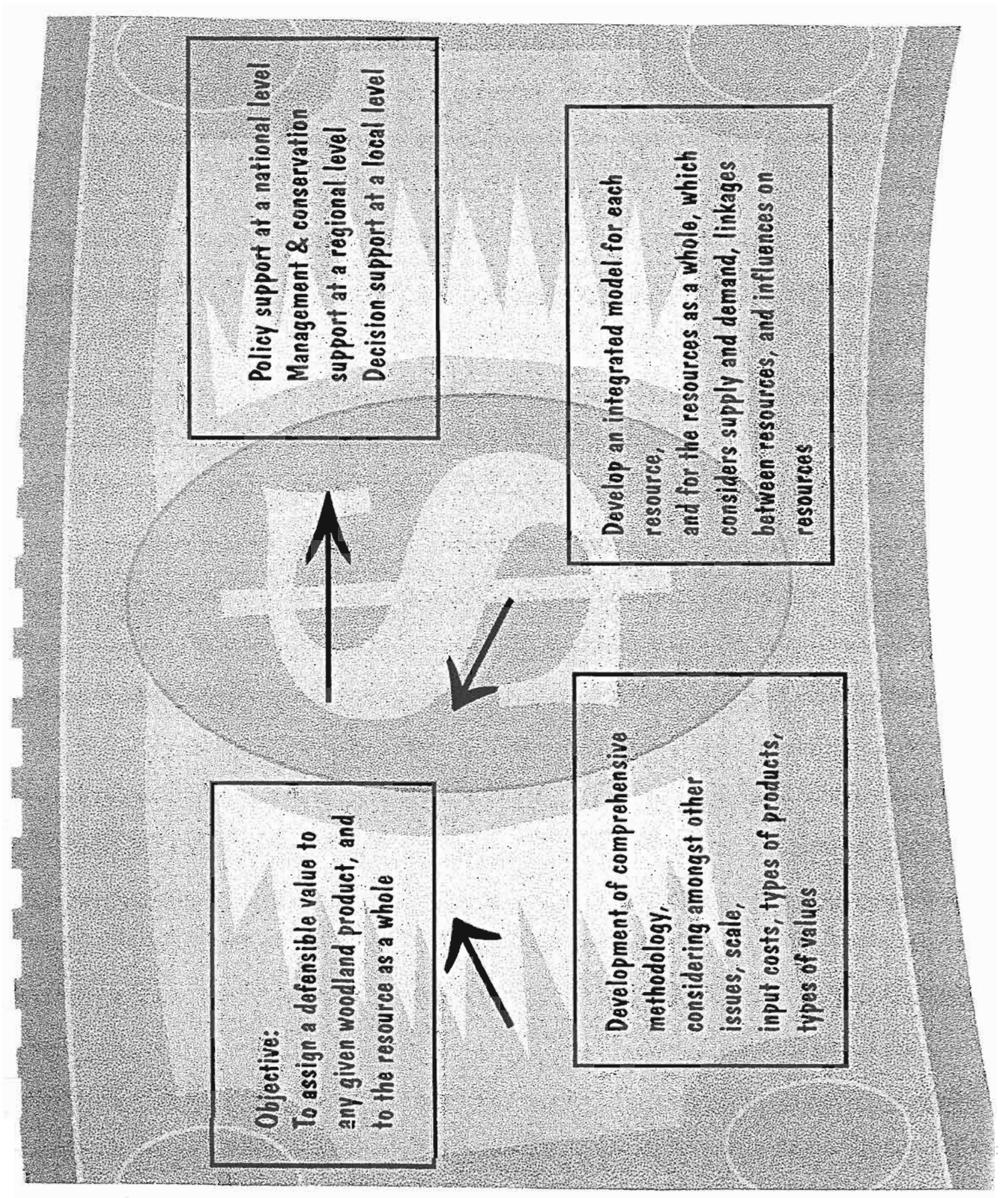

VALUATION OF WOODLAND RESOURCES: A CASE STUDY OF THE BUSHBUCKRIDGE LOWVELD

(Poster)

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Introduction

- Woodlands constitute almost one third of South Africa
- The majority of South Afgrica's rural population resides in woodland areas
- Many households amke use of the woodland areas for grazing and cultivation
- Most households harvest some secondary resources (e.g. thatch grass, edible plants, fuelwood) from the woodlands around them.
- Harvested products make an importnat contribution to household livelihood security, particularly for women and the poorest households
- Secondary products may be used by members of the household, or sold to other users, as means of earning income

Objective

To determine the value of secondary products harvested by rural communities in the Bushbuckridge lowveld as a case study to inform policy pertaining to land tenure and land-use management options.

Approach

- The derived values are summarised from a number of different studies (largely by staff and students of Wits University) between 1991 and 1997
- The focus was on the use of secondary products, and therefore the economic returns from the primary use of the land (e.g. grazing, tourism, etc.) were not included
- Local values are presented, i.e. values paid by individuals or at markets closest to the place

of harvesting. Extraction costs (mainly time taken) are not accounted for

- All values have been corrected to 1998 values by adjusting for inflation at 10 % per annum

Table 1. The proportion of households using (home consumption or sale) secondary products

SECONDARY PRODUCT	PROPORTION OF HOUSEHOLDS USING
Fuelwood	94 %
Edible herbs	92 %
Grass hand-brushes	> 90 %
Twig hand-brushes	90 %
Edible fruits	81 %
Insects	77 %
Grass for weaving	67 %
Weaving reeds	54 %
Indigenous wood for construction	53 %
Medicinal plants	49 %
Thatch grass	36 %
Bushmeat	32 %
Carving timber	29 %
Phragmites reeds	± 20 % (?)
Leaf litter for mulch/fertiliser	12 %
Woodroses	few
Mushrooms	few
Honey	few

Table 2. Summary of total use value

RESOURCE	ANNUAL VALUE PER HECTARE		ANNUAL VALUE PER HOUSEHOLD (R)		
			VALUE USED AT HOME		VALUE TRADED (R)
	(R)	%	(R)	%	
Fuelwood	182.89	21.7	465.35	20.2	unknown
Construction wood	85.29	10.1	218.37	9.5	unknown
Edible fruits	93.45	11.1	213.22	9.2	525
Edible herbs	256.32	30.4	736.8	32	2 625.00
Thatch grass	20.96	2.5	51.15	2.2	50
Carving timber	4.83	0.6	0	-	11.79
Woodroses	1.27	0.2	0	-	1.66
Medicinal plants	149.37	17.7	383.49	16.6	unknown
Weaving reeds	2	0.2	112	4.8	1 140.48
Phragmites reeds	3.66	0.4	11.03	0.5	very small
Twig hand-brush	1.87	0.2	4.56	0.2	14.26
TOTAL	801.91		2 195.97		4 368.19
Other secondary resources (taken as 5 % of the total for all the other products)	40.1	4.8	109.8	4.8	218.41
TOTAL VALUE OF SECOND-ARY PRODUCTS	842.01	100	2 305.77	100	4 586.60

Table 3. The potential annual value of secondary products per hectare for different landuses in the Bushbuckridge lowveld (from Pollard *et al.* 1998)

LANDUSE		POTENTIAL ANNUAL VALUE (R/ha)
Commercial conservation		986
Communal	- rangeland	936
	- arable land	650
Irrigated commercial agriculture		837
Forestry	- Plantations	78
	- Unplanted areas	153

Table 4. Gross margins per hectare (r/ha/yr) from different landuses within the Bushbuckridge lowveld (from Pollard *et al.* 1998)

LANDUSE	GROSS MARGIN (R/ha/yr)
Irrigated annual crops	6 998
Commercial conservation	1 468
Communal rangelands, excluding livestock products and services	936
Dryland agriculture	765
Plantation forestry	390

Conclusions

- Secondary products have a significant value across a range of land-uses (the values derived here are similar to those for KwaZulu-Natal)

- Communal land-use is the only land-use that maximises benefits from secondary products
- Communal management of woodlands represents an economically viable land-use and they are not simply unproductive wastelands

- The common use of secondary products and the high income earned indicates that they make a important contribution to sustainable rural livelihoods

- The importance of these resources to rural livelihoods is not recognised in national accounts and policies

The Challenge

To evolve and implement community-based strategies to ensure resource use is sustainable in the long term

GROWTH, INGROWTH AND MORTALITY OF INDIGENOUS EVERGREEN FORESTS IN SOUTH AFRICA: DIEPWALLE PLOTS-RESULTS OF TEN YEARS

(Poster)

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Introduction

A series of long term sampling sites for measuring increment and mortality were established during the late 1980's in selected forests throughout South Africa (Geldenhuyd and vanm Daan, 1992). These plots were established to provide with comparative data on dynamics of these forests, specifically on growth, ingrowth and mortality parameters. These sites are measured every five years, and most of the sites have had at least one re-measurement.

The Diepwalle increment site was established in 1987 on Diepwalle State Forest in a forest stand representative of forests from which timber is extracted. Diepwalle State Forest is situated in the Southern Cape. A first re-measurement was done during 1992 and was reported on by Geldenhuys (1993). The site is 2.86 ha in size and is subdivided into 286 10X10 plots [11 rows (A to K) X 26 plots]. A complete description of locality, site layout, climate and soils underlying the site can be found in Geldenhuys (1993).

Methods

The initial measurements were done in 1987. All the stems of 5 cm diameter at breast height (dbh) size were measured and recorded by species and dbh. Stems that were greater than 5 cm dbh were recorded by species and a unique number. All the ingrowths (3 cm) were recorded by species and a total number (sum of all the individual).

In order to analyse the data, importance value (IV) for each species was calculated. The importance value is the mean value of relative frequency, relative density and relative basal area [IV = (RF + RD + RBA)/3] . Relative frequency is calculated as the percentage of plots in which the species were present, relative density is calculated as the stem density of a species expressed as percentage of all stems of all species whereas relative basal area of a species is expressed as a percentage of total area of all species.

The stand dynamics were assessed and mean diameter growth was also calculated. The growth of individual species was done through log to log fit. Ingrowth and mortality were calculated for diameter classes.

Results and Discussion

According to the data, the basal area was 39 $m^2 ha^{-1}$ - 40 $m^2 ha^{-1}$ (1987 - 1992); 40 m^2 - 41.3 $m^2 ha^{-1}$ (1992 - 1997). There was 0.1 % and 0.6 % growth increase basal area per annum respectively. The growth increase was insignificant per dbh class (Table 1) since 1987 to 1997.

After regressing the growth (dependent variable) against basal area (dependent variable) and that of basal area against stems per plot, it was found that their regression coefficients showed some positive relationships. The high coefficient variation suggests that the basal area does not limit growth or stem density.

Mortality increased tremendously from 104 in 1992 to 229 in 1997 (Table 2). Mortality increase in 1997 was more than double that of 1997. This high mortality increase was mainly attributed to windthrows of large canopies damaging the saplings. Predominantly, this high mortality rate occured on 5 - 9.9 cm dbh class of saplings (Table 4).

It was found the ingrowth constituted 9 % of total stems in 1992 and 6 % in 1997 respectively. In the stand, ingrowth was composed of > 80 % of total species. The stand structure and species composition did not change significantly. There was wide range regression slopes of different species (Table 5) which suggests that there were differences in growth rates between species.

Conclusion and Recommendations

Conclusively, after 10 years of growth measurements in the Diepwalle State Forest, it was found that its forest biomass narrowly fluctuated. This slight growth fluctuation is typical of a forest in a steady state of equilibrium.

The harvesting method for timber at the Diepwalle State Forest was only aimed at mortality pre-empted stems. This kind of harvesting did not show any impact or significant change in forest growth. It was then recommended that the stand be manipulated by means of various harvesting intensities to ascertain their effects on species composition and responses on growth.

It was also recommended that variables like disturbance, competition, genetics, edaphic and climatic factors be incorporated in this growth study in order to quantify growth in full.

Table 1. Stand density, basal area and mean dbh per diameter class for the three years of measurement of the Diepwalle increment plot.

		Diameter class in cm.			
Stand variable	Year	5-9.9	10-29.9	30+	Total
Stand density (Stems ha^{-1})	1987	677	545	152	1374
	1992	735	587	156	1478
	1997	736	590	158	1484
Basal area ($m^2 ha^{-1}$)	1987	2.71	12.84	23.44	38.99
	1992	2.94	13.6	24.06	40.6
	1997	2.99	13.75	24.59	41.33
Mean DBH (cm)	1987	7.01	16.33	43.17	14.72
	1992	7.00	16.34	43.24	14.52
	1997	7.05	16.39	43.27	14.63

Table 2. Summary of changes in stems, basal area, mortality and ingrowth for the three years in which the Diepwalle increment study site was monitored.

Parameter	1987	1992	1997
Total stems	3690	4226	4246
Basal area (m^2)	111.52	116.09	118.19
Mortality (stems)		104	229
Mortality (area)		2.97	5.32
Stems shrunk since last measurement		5	262
Basal area lost through shrinkage		0.0054	0.1735
Stems which had no growth		617	409
Stems which had positive growth		3234	3326
Total ingrowth (stems)		370	249
Total ingrowth (m^2)		1.8	0.97

Table 3. Changes in diameter class distribution of trees in the Diepwalle increment study site between 1987 and 1997 due to diameter growth, ingrowth and mortality

DBH Class	1987	1992					Difference 1987-1992	1997					Difference 1992-1997
	Standing crop	Ingrowth		Mortality		Standing crop		Ingrowth		Mortality		Standing crop	
	stems ha^{-1}	stems ha^{-1}	m^2 ha^{-1}	stem ha^{-1}	m^2 ha^{-1}	stems ha^{-1}	stems ha^{-1}	stems ha^{-1}	m^2 ha^{-1}	stem ha^{-1}	m^2 ha^{-1}	stems ha^{-1}	stems ha^{-1}
10	688.1	119.6	0.3104	21.3	0.0812	745.5	57.4	85	0.5943	49.7	0.1673	745.5	0
15	278.3	3.5	0.0367	6.6	0.0707	290.2	11.9	0.7	0.0262	13.3	0.1524	288.8	-1.4
20	139.2	2.4	0.0489	2.4	0.0573	150.3	11.1	0.7	0.0501	5.9	0.1568	151.4	1.1
25	73.8	2.1	0.0842	1.4	0.0513	78.3	4.5	0	0	2.4	0.0881	85.3	7
30	54.9	1.4	0.0809	0.7	0.0411	60.5	5.6	0	0	2.4	0.1446	55.9	-4.6
35	38.1	0	0	1.4	0.1116	36.4	-1.7	0	0	0.7	0.0591	36.7	0.3
40	27.6	0	0	0	0	32.5	4.9	0	0	1	0.1206	35.3	2.8
45	28.7	0	0	0	0	27.3	-1.4	0	0	1.4	0.1017	26.9	0.3
50	21.3	0.3	0.0692	0.7	0.0581	19.9	-1.4	0.7	0.3005	0.7	0.2399	21.3	1.4
55	14.7	0	0	0.7	0.2219	15.7	1	0	0	1	0.2261	13.6	-2.1
60	9.8	0	0	0.7	0.1809	10.1	0.3	0	0	1	0.2671	11.9	1.8
65	5.9	0	0	0	0	5.9	0	0	0	0	0	7	1.1
70	2.4	0	0	0	0	2.4	0	0	0	0	0	2.1	-0.3
75	0.7	0	0	0.3	0.1369	1.7	1	0	0	0.3	0.1649	1.7	0
80	1	0	0	0	0	0.7	-0.3	0	0	0	0	1	0.3
Total	1384.5	129.3	0.6303	36.2	1.011	1477.4	92.9	87.1	0.9711	79.8	1.8886	1484.4	7

Table 4. Mortality of individual tree species in different diameter classes for two monitoring periods of increment study site.

Species	Mortality 1992						Mortality 1997					
	Number of stems per ha per diameter classes (cm)						Number of stems per ha per diameter classes (cm)					
	5-9.9	10-29.9	30+	Total	% of Total	Basal area	5-9.9	10-29.9	30+	Total	% of Total	Basal area
Podocarpus falcatus												
Podocarpus latifolius	1.7	0.7	0.7	3.1	8.7	0.2377	3.8	3.1	0.3	7.2	9.2	0.2238
Ocotea bullata	1.4		0.3	1.7	4.8	0.0345	1.7			1.7	2.2	0.0048
Trichocladus crinitus												
Lachnostylis hirta	0.7	0.7		1.4	3.9	0.0299	1			1	1.3	0.0026
Ilex mitis												
Maytenus peduncularis	0.7			0.7	2	0.0029	0.7	1.4		2.1	2.7	0.0459
Pterocelastrus tricuspidatus	1.7			1.7	4.8	0.0083	4.9	1.7		6.6	8.4	0.0514
Cassine eucleiforme	0.7			0.7	2	0.0041	1	0.3		1.3	1.7	0.0076
Cassine pappilosa	0.7	1		1.7	4.8	0.0195	4.9	1.7		6.6	8.4	0.0697
Apodytes dimidiata		0.7	0.7	1.4	3.9	0.0651	0.3	0.7	0.3	1.3	1.7	0.0799
Rhamnus prinoides	0.3			0.3	0.8	0.0009	0.3	0.3		0.6	0.8	0.0043
Ochna arborea	1	0.3		1.3	3.6	0.0065	0.7	1		1.7	2.2	0.0194
Trimeria grandifolia												
Olinia ventosa							0.3			0.3	0.4	0.0011
Curtisia dentata	1.4	1		2.4	6.7	0.0399	2.1	0.7		2.8	3.6	0.0201
Rapanea melanophloeos												
Diospyros whyteana	1.7	0.3		2	5.6	0.015	1.4	0.7		2.1	2.7	0.013
Chionanthus foveolata	0.3			0.3	0.8	0.0008						
Olea capensis subsp. macrocarpa	2.4	1.4	2.1	5.9	16.5	0.4738	5.9	5.9	5.6	17.4	22.1	1.1594
Olea capensis subsp. capensis	0.3	0.7		1	2.8	0.0109	0.3	1		1.3	1.7	0.0309
Nuxia floribunda	0.7			0.7	2	0.0022	1	0.7		1.7	2.2	0.0153
Gonioma kamassi	1.4	2.8		4.2	11.8	0.0464	7	2.8		9.8	12.5	0.0671
Halleria lucida	2.1	0.7		2.8	7.8	0.0133	1.7	0.3		2	2.5	0.0092
Burchellia bubalina	1.4			1.4	3.9	0.0034	7.7			7.7	9.8	0.0402
Rothmannia capensis												
Canthium inerme							0.3			0.3	0.4	0.0009
Canthium mundianum	0.3			0.3	0.8	0.0008	0.7	1		1.7	2.2	0.0229
Psydrax obovata		0.7		0.7	2	0.0231	1.4			1.4	1.8	0.0045
Total	20.9	11	3.8	35.7	100.1	1.0390	49.1	23.3	6.2	78.6	100.5	1.894

Table 5. Results of the natural log on log regressions between individual species growth (dependant variable)(m^2 $ha^{-1}yr^{-1}$) and diameter (independant variable)(cm). The analyses were done on 20 common species occurring in the Diepwalle increment study site.

Species	X-coefficient	Constant	D.F	r^2
Podocarpus falcatus	1.54	-12.10	77	0.7620
Podocarpus latifolius	1.21	-11.52	929	0.5570
Ocotea bullata	1.35	-12.36	82	0.6387
Maytenus peduncularis	1.19	-11.79	142	0.3558
Pterocelastrus tricuspidatus	1.34	-11.74	345	0.4047
Cassine pappilosa	1.43	-12.38	422	0.4162
Apodytes dimidiata	1.50	-12.74	188	0.5273
Ochna arborea	0.50	-10.73	145	0.0509
Olinia ventosa	1.88	-12.71	41	0.6894
Curtisia dentata	1.34	-11.98	552	0.4694
Rapanea melanophloeos	2.48	-13.92	34	0.6645
Diospyros whyteana	1.02	-11.71	171	0.1681
Olea capensis ssp macrocarpa	1.55	-12.59	1261	0.6446
Olea capensis ssp capensis	1.68	-13.16	73	0.4757
Nuxia floribunda	1.08	-11.16	99	0.2501
Gonioma kamassi	0.95	-10.99	1166	0.1703
Halleria lucida	1.33	-12.38	39	0.1872
Burchellia bubalina	0.79	-11.22	280	0.0586
Canthium mundianum	0.95	-11.00	139	0.2156
Psydrax obovatum	1.00	-10.95	138	0.4271

APPENDIX 1: NOTES & DISCUSSIONS REGARDING THE NEED FOR AND FORMAT OF FUTURE SYMPOSIA

During the final session of the symposium opinions were illicted from participants regarding whether or not there was a need for such symposia to be held regularly, and if yes, what the format should be. Participants were divided into three groups, and each group discussed these questions and then reported back in plenary session. The reports are summarised here, to act as a source reference for future planning committees.

GROUP 1

Need for a Woodlands Forum and future symposia

- Agreed that a forum was necessary, and that an annual symposium was desirable
- Such a forum should be a loose, informal structure coordinated by DWAF, and any other agencies that they wish to co-opt
- Start loose and informal. It may evolve into a more formal structure in time, but do not push it
- Need to ensure that such a forum has strong links to the NFAC

Arrangements for future symposia

- Symposium should be 2 - 2.5 days long
- It should have field trip component on the first day or the last day, but not in the middle. The field trip should be relevant to the symposium theme, and should be focused.
- The venue of the symposium should be appropriate for the theme.
- There was insufficient time between the first announcement of the symposium and the actual date it was held. The programed should be circulated in advance. Delegates should be provided with a pen and paper upon registration.
- The symposium should have presentations relevant to woodlands and to forests.
- The should be greater representation from policy analysts, donors and NGOs.
- Noted that the quality of overhead transparencies was very poor for several presentations.
- The final workshop session should address the symposium theme.

Enhancing communication between agencies and individuals working on issues relating to woodlands and forests

- DWAF should compile and maintain a data base of individuals and projects
- Need to recognise th value of e-mail as a communication tool
- Need to strengthen international links
- Need to ensure any woodlands forum is SADC linked and not just RSA
- Newsletters are a useful communication tool

- Need to tap into existing networks and data bases
- need a mechanism to ensure that information is accessible to local communities
- Urgent need for improved inter-departmental communication and research, especially DWAF, DEAT and DLA

GROUP 2

Need for a Woodlands Forum and future symposia

- There is a need for a Woodlands Forum and there should be an annual meeting
- DWAF must organise with the Steering Committee or they must run the Forum, but a Steering Committee allows for an even spread of agencies and participants
- Having DWAF run the annual symposium promotes their image as custodians of the woodlands
- Needs to be SADC wide initiative, perhaps venue global
- But do not loose national perspective
- Secretariat is not necessary for a Woodlands Forum, this should reside in the steering committee.
- Steering committee can contract a particular agency to organise the symposium if required
- Steering Committee should develop a web-site, coordinated by DWAF

Arrangements for future symposia

- Should be 3 days long, plus 1 day for a field trip
- Details and programed should be distributed earlier
- The theme of this one had too much social issue. Each symposium should have a new theme.
- Field trip should be in the middle of the symposium
- The field trip lacked focus and spent too much time at a single point
- Invitations should be individuals as well as to institutions
- Need more representation for Agriculture
- It must be kept affordable
- Do not separate forest and woodlands components - they must be integrated
- Venue should change from year to year
- Could have more than one theme per symposium

GROUP 3

Need for a Woodlands Forum and future symposia

- There is a need for Forum
- DWAF should coordinate, but can delegate to other organizations as necessary
- The forum should have participants from as wide a range of stakeholders as possible, including resource users
- Should be an annual meeting

Arrangements for future symposia

- Programed should be circulated prior to the symposium
- This symposium as badly timed in that it required delegates to arrive on a public holiday
- If multiple vehicles used for the filed trip, each vehicle must have someone familiar with the area and issues
- There were insufficient presentations on community projects or use of woodlands
- Venues must change from year to year
- Objectives of the symposium were not clearly stated
- Some obvious key role players were absent
- Should have an invited speaker with a social science perspective
- need to ensure that there is sufficient discussion time and workshop opportunities
- Must ensure an equal mix of woodlands and forest presentations
- Need more exposure of indigenous knowledge, and more participation of local community delegates

Enhancing communication between agencies and individuals working on issues relating to woodlands and forests

- Create a website
- Need an annual symposium
- A newsletter
- Need improved communication between national and provincial competencies, and then between government agencies and NGOs and CBOs
- The is a lack of capacity for coordination of linkages
- Perhaps can also have provincial fora that arrange their own meetings, with role players from national level
- DWAF needs to prioritise its research needs and communicate them to stakeholders.
- Need to take cognizance of other research efforts to avoid duplication

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APPENDIX 3: SYMPOSIUM PROGRAMME

Monday 10th August

16:30 - 19:30 Registration of delegates at Mountain View Hotel

Tuesday 11th August

08:00 - 08:55 Registration (cont.) of delegates at Mountain View Hotel

Session 1 - Keynote Speakers		(Chair: Ms Carla Willis)
09:00 - 09:30	Opening Address & Welcome	Ms Lael Bethlehem (Chief Director, Dept of Water Affairs & Forestry)
09:30 - 10:15	International trends in woodland management	Mr Mike Pitcher (DIFID) & Dr Isla Grundy (University of Stellenbosch)
10:15 - 10:45	Cultivating a new relationship with forests	Dr Jabulani Mjwara (Director: Conservation Forestry, Dept of Water Affairs 7 Forestry)
10:45 - 11:15	TEA	
11:15 - 11:45	Community perspectives on woodland issues and polices	Mr Richard Tshivhase (Tshivhase Territorial Council)

Session 2 - Policy issues		(Chair: Dr Charlie Shackleton)
11:45 - 12:10	Sustainable forest management in a new policy context - what has changed?	Dr Coert Geldenhuys (ForestWood)

12:10 - 12:35	Policy implications of the potential impact of the land reform programme on the woodland resource	Prof. Helen Watson (University of Durban-Westville)
12:35 - 13:00	Market and non-market incentives for sustainable woodland management: a review of experiences from Zimbabwe	Dr Robson Mutandi (SAFIRE)
13:00 - 14:00	LUNCH	

Session 3 - Management Institutions & Approaches		(Chair: Mr Thiambi Netshiluvhi)
14:00 - 14:25	Institutional arrangements for sustainable woodland management in communal areas	Mr Graham von Maltitz (Environmentek, CSIR)
14:25 - 14:50	Community management of wood-fuel supply: pilot project	Dr Lidia Brito (Eduardo Mondlane University)
14:50 - 15:15	Management of Eastern Cape natural forests	Mr George von dem Bussche (DWAF)
15:15 - 15:40	Woodland management: Venda perspectives	Mr Konanani Khonommbi (Northern Province Dept of Land, Agriculture & Environment)
15:45 - 16:15	TEA	

Session 4 - Poster presentations		(Chair: Dr Harry Biggs)
16:15 - 16:20	Estimating the status of woodland resources in South Africa	Mr Mark Thompson & Ms Anna Ballance (Environmentek, CSIR)
16:20 - 16:25	Criteria and indicators for environmentally sustainable development of terrestrial ecosystems	Mr Albert Froneman (Environmentek, CSIR)
16:25 -16:30	Multiple-use management of the southern Cape forests	Mr Dag Willems (DWAF)
16:30 - 16:35	Gaba: a case study for joint forest Management	Ms Sara Venter (DWAF)

16:35 -16.40	How much are our woodlands worth?	Ms Anna Ballance (Environmentek, CSIR)
16:40 - 16:45	Valuation of woodland resources: a case study of the Bushbuckridge lowveld	Dr Charlie Shackleton & Ms Sheona Shackleton (Environmentek, CSIR)
16:45 - 16:50	Growth, in-growth and mortality of indigenous evergreen forest	Mr Thiambi Netshiluvhi (Environmentek, CSIR)
16:50 - 16:55	Mopane woodland research	Prof. Dirk Wessels (University of the North)

Wednesday 12th August

Field trip (Led by Ms Sarah Venter)

07:30	Depart from Mountain View Hotel
09:00	Arrive at Tshakhuma for the first presentations and discussions
12:00	Picnic lunch at Thathe Vondo State Forest
14:00	Visit to Sacred Lake Fundudzi with presentations
17:00	Arrival back at Mountain View Hotel

Thursday 13th August

Session 1 - Woodland research & productivity (Chair: Mr Graham von Maltitz)

08:30 - 08:55	Woodland research initiatives in the Kruger National Park region, and how they fit with our objectives	Dr Harry Biggs (SA National Parks Board)
08:55 - 09:20	Estimating sustainable production of fuel-wood, leaf forage and fruits from structural characteristics of savannas	Dr Charlie Shackleton (Environmentek, CSIR)

09:20 - 09:45	An assessment of the harvesting of bark for medicinal purposes from the woodlands of southern Maputaland	Mr Wayne Twine (University of the Witwatersrand)
09.45 - 10:10	Domestication of indigenous fruit trees	Mr Cori Ham (University of Stellenbosch)
10:15 - 10:40	TEA	

Session 2 General discussions & workshop	(Chair: Ms Carla Willis & Dr Charlie Shackleton)

10:40 - 11:00 General Discussion and clarification of workshop issues and tasks

11:00 - 11:50 Workshop discussions

11:50 - 12:20 Report back and wrapping up

12:20 CLOSURE